MAR 05 1993 (11)

Station #12

START

ENGINEERING DATA TRANSMITTAL

162

0026708

Page 1 of 1

1. EDT 140910

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Record File	Environmental Restoration Engineering	N/A
5. Proj./Prog./Dept./Div.:	**6. Cog. Engr.:**	**7. Purchase Order No.:**
300-FF-5 Remedial Investigation	L.C. Hulstrom	N/A
8. Originator Remarks:		**9. Equip./Component No.:**
Release to Record File		N/A
		10. System/Bldg./Facility:
		N/A
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		N/A
		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:
		None

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15. DATA TRANSMITTED

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1	WHC-SD-EN-TI-105		0	Data Validation Summary Report 300-FF-5 Round 2 Groundwater (All Fractions)	4	1/2	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

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2	1	Cog.Eng. L. C. Hulstrom	LC Hulstrom	2/23/93	H6-03	EDMC			H4-22	3	
2	1	Cog. Mgr. R. A. Carlson	RACarlson	2/23/93	H6-03	IRA Clearance			H4-17	3	
		QA				Central Files			L8-04	3	
		Safety									
		Env.									

18. B.E. Innis — B.E. Innis 2-23-93
Signature of EDT Originator — Date

19. _____ _____
Authorized Representative for Receiving Organization — Date

20. R.A. Carlson — RACarlson 2/23/93
Cognizant/Project Engineer's Manager — Date

21. DOE APPROVAL (if required) Ltr. No.
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[] Approved w/comments
[] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

BD-7400-172-1 (07/91)

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SUPPORTING DOCUMENT

1. Total Pages 152

2. Title	3. Number	4. Rev No.
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5. Key Words

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6. Author

Name: L. C. Hulstrom

L C Hulstrom 2/23/93
Signature

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7. Abstract

Hulstrom, L. C., 1993, Data Validation Summary Report 300-FF-5 Round 2 Groundwater (All Fractions), WHC-SD-EN-TI-105, Rev. 0, prepared by Ebasco/Hart Crowser, for Westinghouse Hanford Company, Richland, Washington.

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9. Impact Level 4

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TABLES

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1.0 INTRODUCTION

Laboratory data for Second Round groundwater samples collected during the 300-FF-5 Operable Unit Remedial Investigation/Feasibility study have been reviewed and validated to ensure that they are of sufficient quality to support decisions regarding further actions to be taken at the 300-FF-5 Operable Unit. The initial results of this review have been previously documented in a series of Preliminary Quality Assurance reports previously provided to Westinghouse Hanford. This report summarizes the results previously presented in the Preliminary Quality Assurance reports for all of the Second Round groundwater samples. In some instances, the data qualifiers originally presented in the Preliminary Quality Assurance reports have been changed based upon further review of all of the data for the Second Round groundwater samples; these instances are highlighted in the text.

Throughout this report, various standard abbreviations have been used to note the qualifications associated with sample results. These abbreviations are summarized in Table 1-1.

1.1 CHEMICAL ANALYSES

Data from the chemical analysis of eighty-six samples from the 300-FF-5 Operable Unit Remedial Investigation and their related quality assurance (QA) samples were reviewed and validated to verify that reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. Twenty-three analytical cases were analyzed by Thermo Analytical Laboratories (TMA) using U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) protocols. Five analytical cases were analyzed by Roy F. Weston (Weston) Laboratories using CLP protocols. Sample analyses included:

- Volatile organics (86 aqueous samples);
- Pesticides and polychlorinated biphenyls (PCBs) (41 aqueous samples);
- Metals (86 aqueous samples); and
- General chemical parameters (51 aqueous samples).

1.2 RADIOCHEMICAL ANALYSES

Data from the radiochemical analysis of two analytical cases analyzed by TMA, and one analytical case analyzed by Weston were validated. Both laboratories used analytical protocols specified in the *Remedial Investigation/Feasibility Study Work Plan for the 300-FF-5 Operable Unit, Hanford Site* (DOE 1990). Sample analyses included the following:

- Gross alpha and gross beta determination (39 aqueous samples);
- Strontium 90 (39 aqueous samples);
- Technetium 99 (37 aqueous samples);
- Uranium isotopes (39 aqueous samples);
- Total uranium (39 aqueous samples);
- Gamma spectroscopy (39 aqueous samples); and
- Tritium (2 aqueous samples).

1.3 WESTINGHOUSE HANFORD GUIDANCE USED

Data quality was reviewed and analytical results were validated using EPA CLP protocols and guidelines, and related Westinghouse Hanford Company (WHC) procedures (WHC 1992a and 1992b). Data were qualified based on their quality and the guidance provided by these sources. Instances where Westinghouse Hanford procedures are more restrictive than CLP protocols were noted, particularly with regard to holding times for pesticide/PCB analyses. Data were validated to CLP protocol for holding times in these instances, and the potential difference in results if Westinghouse Hanford procedures are used are discussed.

1.4 MAJOR DEFICIENCIES

Volatile Organic Analyses. No samples were rejected due to deficiencies in data quality.

Pesticide and PCB Analyses. No pesticide/PCB data were rejected due to deficiencies in data quality.

Metals Analyses. Selenium data in Case N204110 and thallium data in Case N205055 were qualified as rejected due to low matrix spike percent recoveries.

General Chemistry Analyses. No sample data were rejected due to deficiencies in data quality.

Radiochemical Analyses. No sample data was rejected due to deficiencies in data quality.

1.5 GENERAL QUALITY TRENDS

Several general quality trends that resulted in data qualification were observed. These include the following:

- Blank contamination was noted in method blanks analyzed for volatile organic compounds.
- Some holding time exceedences between sample collection and analysis, and lack of daily calibrations for ion chromatography, ammonia, and pH were observed for analyses performed by TMA.
- The method precision for radiochemical analysis for a large number of samples could not be determined because replicate sample results were less than the minimum detectable amount (MDA).
- Method accuracy was less than acceptable criteria for a number of radiochemical results.

Table 1-1 - Glossary of Data Qualifiers

U	Indicates the compound or analyte was analyzed for and not detected. The value reported is the sample quantitation limit corrected for sample dilution and moisture content by the laboratory.
UJ	Indicates the compound or analyte was analyzed for and not detected. Due to quality control deficiencies identified during data validation the value reported may not accurately reflect the sample quantitation limit.
J	Indicates the compound or analyte was analyzed for and detected. The associated value is estimated but the data are useable for decision making processes.
R	Indicates the compound or analyte was analyzed for and due to an identified quality control deficiency the data are useable.
JN	Indicates presumptive evidence of a compound at an estimated value.
N	Indicates presumptive evidence of a compound.
UJN	Indicates the compound or analyte was originally identified from presumptive evidence. Due to quality control deficiencies identified during data validation the value reported may not accurately reflect the sample quantitation limit.

2.0 VOLATILE ORGANIC DATA VALIDATION AND LIMITATIONS

2.1 SUMMARY

2.1.1 Eleven Sample Delivery Groups

Sample results from the following eleven volatile organic cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
Weston	9205L304	1	1
TMA	A205003	5	5
Weston	9205L332	3	3
Weston	9205L406	1	1
TMA	A204064	10	4
TMA	A205049	21	8
TMA	A205072	8	3
TMA	A205017	16	2
TMA	A205025	2	0
TMA	A205007	7	4
TMA	A205032	11	2

Data qualifiers assigned to the 300-FF-5 compounds of concern (1,2-dichloroethene, methylene chloride, tetrachloroethene, and trichloroethene) and for all other compounds originally reported as detected for these cases are summarized in Table 2-1.

2.1.2 All Samples Validated

Results for all the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. All of the reported results for quality assurance samples associated with these cases were reviewed. For Case A205017 one hundred percent of the quality assurance sample results were recalculated and quality control

calculations verified. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

2.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedures for Chemical Analyses (WHC 1992a). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), and the EPA's Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA 1988b).

2.1.4 Samples Analyzed According to CLP Protocols

Eighty-six low level water samples (including 5 equipment blanks and 35 trip blanks) were submitted for analysis. Analyses were performed according to the 1988 or 1990 CLP protocol (EPA 1988c and 1990).

Sample analyses were performed using five gas chromatograph/mass spectrometer (GC/MS) systems. One was outfitted with a packed column. Four were outfitted with capillary columns. The data were evaluated against equivalent quality control requirements, and are comparable. Instances of failure to comply with various technical requirements established by CLP protocols resulted in qualification of the data. The specific problems observed during the quality assurance review are detailed in the sections below.

The analysis was complete and met the method and work plan contract required quantification limit (CRQL) requirements (DOE 1990) in all cases.

2.1.5 Minor Deficiencies Noted

There were minor deficiencies associated with the analyses which resulted in the qualification of data. These included: minor blank contamination; calibration criteria exceedences; and sample concentrations reported below the quantification limit. These deficiencies and the resulting data qualifications are explained in greater detail below.

2.2 ANALYTICAL METHOD

2.2.1 Gas Chromatography/Mass Spectrometer Tuning Criteria Met

Tuning is performed to ensure that mass resolution, identification, and, to some degree, sensitivity of the gas chromatography/mass spectrometry (GC/MS) instrument have been established. When analyzing for volatile organics, instrument tuning is performed with bromofluorobenzene (BFB). Instrument tuning must be performed prior to the analysis of either standards or samples and must meet the criteria established by the analytical protocol. The specific criteria for acceptable GC/MS instrument tuning using BFB are outlined in Westinghouse Hanford (WHC 1992a) and in EPA (1988b).

The original tuning data were checked for transcription and calculation errors in one of the packages (Case A205017). In the remaining ten data packages, tuning and mass calibration summary forms (Form V) were evaluated to verify that tuning criteria were met. Prior to calibration and sample analysis, all tuning criteria were met. Therefore, no data were qualified based on the tuning results.

2.2.2 Acceptable Calibration

Instrument calibration is performed to establish that the GC/MS instrument is capable of producing acceptable and reliable analytical data over a range of concentrations. The initial and continuing calibrations are to be performed according to CLP protocols. An initial multipoint calibration is performed prior to sample analysis to establish the linear range of the GC/MS instrument. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day-to-day basis.

A detailed description of the results for the initial and continuing calibrations performed is presented below.

2.2.2.1 No Initial Calibration Exceedences

Instrument response is established when the relative response factors (RRFs) for all target compounds are greater than or equal to 0.05 units (EPA 1988a) or the minimum criteria specified in the SOW (EPA 1990). Linearity is established when the relative standard deviations (RSDs) of the RRFs are less than or equal to 30 percent (EPA 1988a) or 20.5 percent (EPA 1990). For samples analyzed according to the 1988 SOW (EPA 1988a) all exceedences of these requirements are qualified. For samples analyzed according to the 1990 SOW (EPA 1990) only some of the compounds are required to meet these criteria, and minor exceedences of common problem compounds are not qualified.

For each of the eleven cases the initial calibrations met the criteria. Therefore, no data were qualified based on the initial calibration results.

2.2.2.2 Minor Continuing Calibration Exceedences

The criteria for accepting the continuing calibration require that a 50 µg/L standard be analyzed at least once per 12-hour period and that the RRFs of all target compounds be greater than or equal to 0.05 units (EPA 1988a) or the minimum criteria specified in the SOW (EPA 1990). In addition, the percent difference (%D) of these RRFs must be less than or equal to 25 percent (EPA 1988a and 1990) of the average RRFs calculated for the associated initial calibration. For samples analyzed according to the 1988 SOW (EPA 1988a) all exceedences of these requirements are qualified. For samples analyzed according to the 1990 SOW (EPA 1990) only some of the compounds are required to meet these criteria, and minor exceedences of common problem compounds are not qualified.

The required analysis frequency and criteria for continuing calibration were met for the eleven cases, except as noted.

Case 9205L304. The laboratory performed one continuing calibration verification (CCV) standard analysis. A CCV was analyzed on May 14, 1992, on instrument 4900R. The CCV %D criteria were met with the exception of bromodichloromethane (55.5 percent), 4-methyl-2-pentanone (29.8 percent), and 1,1,2,2-tetrachloroethane (28.0 percent). These compounds were not detected in the associated sample (B062R3). Therefore, the associated quantification limits were qualified as estimates (UJ) for these three compounds.

2.2.3 Blanks

Method blank and field blank analyses are performed to determine the extent of laboratory or field contamination of samples. If the sample concentration for a compound is less than five times the blank concentration (ten times if the compound is a common laboratory contaminant), the sample concentration is qualified as undetected (U).

2.2.3.1 Minor Method Blank Contamination

One method blank was analyzed during each 12-hour period, on each instrument. Several compounds were detected in the blanks at low concentrations. These included: methylene chloride, acetone, 1,1,1-trichloroethane, chloroform, and a few tentatively identified compounds (hexane, substituted alkanes). Based on the 5 times and 10 times criteria, all associated sample data were qualified as undetected (U).

A listing of the blank concentrations, associated samples, and qualifier assignments can be found on Form B-3 of the data validation supporting documentation field with the original data package.

2.2.3.2 No Field or Equipment Blank Contamination

Several field blanks and equipment blanks were analyzed with the samples. There were compounds detected in the field blank samples, at levels comparable to the method blank concentrations. These results were therefore qualified as undetected (U) based on the method blank contamination.

2.3 HOLDING TIMES

Analytical holding times were assessed to ascertain whether the CLP holding time requirements for volatile organic analyses were met by the laboratory. The CLP holding time requirements for volatile organic analyses are as follows: aqueous samples must be analyzed within 7 days of the date of sample collection (if unpreserved) and 14 days of the date of sample collection (if preserved); and all samples must be shipped on ice to the laboratory and stored at 4°C until analysis.

The holding times were acceptable for all of the samples associated with these eleven cases. Therefore, no qualifiers were assigned based on the holding time.

2.4 ACCURACY

Accuracy was assessed by evaluating the recoveries of stable isotopically labeled surrogate compounds added to all samples and blanks, matrix spikes, and by the analysis of a representative sample, which was spiked with a variety of volatile organic compounds. The overall accuracy goal for the four compounds of concern is ± 25 percent.

2.4.1 Surrogate Compound Recoveries Acceptable for All Samples

Matrix-specific surrogate compound recovery control windows have been established by the EPA CLP program. When a surrogate compound recovery is out of the control window, all positively identified target compounds associated with the unacceptable surrogate recoveries are qualified as estimates (J). Undetected compounds are qualified as having an estimated detection limit (UJ).

The surrogate compound recoveries calculated for the three stable isotopically labeled surrogate compounds were all acceptable for all cases, and ranged from 92 to 113 percent. Therefore, no qualifiers were assigned based on surrogate percent recoveries.

2.4.2 Matrix Spike Recoveries Acceptable

Matrix spike compounds are added to a sample, which is representative of the sample delivery group. Matrix spike analyses are performed in duplicate using five compounds specified by CLP protocols. The recoveries for the five compounds should be within the established quality control limits (EPA 1988b and 1990). The matrix spike analyses estimate how much the target compounds are interfered with, either positively or negatively, by the sample matrix.

Eleven aqueous matrix spike samples were analyzed with the eleven cases addressed in this report.

The matrix spike compound recoveries were all acceptable for all cases, and ranged from 75 to 115 percent. Therefore, no qualifiers were assigned based on matrix spike percent recoveries.

2.5 PRECISION ACCEPTABLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed matrix spike/matrix spike duplicate (MS/MSD) analyses, precision may also be assessed using unspiked duplicate sample analyses. Field precision is measured by analyzing duplicate samples taken in the field. Interlaboratory precision is measured by analyzing duplicate samples ("field splits") by two analytical laboratories. The overall precision goal for the four compounds of concern is ± 10 percent.

2.5.1 Matrix Spike Duplicates Acceptable

Eleven matrix spike duplicate samples were analyzed with the eleven cases addressed in this report.

The matrix spike duplicate RPDs were acceptable for the eleven cases, and ranged from 0 to 10 percent. Therefore, no qualifiers were assigned based on the matrix spike duplicate precision.

2.5.2 Field Duplicates Analyzed

There were four sets of field duplicate samples analyzed for volatile organics (B06302 and B062C7 of Case A205003; B06305 and B062T2 of Case A205007; B06308 and B062P9 of Case A205017; and B06311 and B062X1 of Case A205032).

For all these samples, the compounds of concern were not detected, and other compounds were detected at concentrations less than five times the CRQL. Therefore, field duplicate precision could not be evaluated.

Full presentation of field duplicate data and RPD calculations are given in Appendix A. No qualifiers were assigned based on field duplicate precision data.

2.5.3 No Interlaboratory Precision Data

There were field split samples analyzed, but the Weston data has not yet been received for review. Therefore, interlaboratory precision could not be evaluated.

No qualifiers were assigned because of this lack of interlaboratory precision data.

2.6 INTERNAL STANDARD PERFORMANCE ACCEPTABLE

Internal standard performance was assessed to determine whether abrupt changes in instrument response and sensitivity occurred that may have affected the reliability of the analytical data. The response (area or height) of the internal standards must not vary by more than +100 percent or -50 percent from the response of the internal standard that was used to calculate the upper and lower bounds. The upper and lower bounds define the range for acceptable internal standard response (area/height) for the sample analyses. The criteria for internal standard performance were met in all cases. Therefore, no qualifiers were assigned based on internal standard performance.

2.7 IDENTIFICATION OF COMPOUNDS

The identity of detected compounds was confirmed by investigating the possibility of false positives. The confirmation of compound identification during the quality assurance review focuses on false positives because only mass spectra for positive identifications are submitted. Confirmation of possible false negatives is addressed by reviewing other factors relating to analytical sensitivity (e.g., relative response factors, detection limits, linearity, analytical recovery).

The compound identifications were confirmed by the validator. The compounds that were confirmed to be present in samples associated with these eleven cases include 1,2-dichloroethene, trichloroethene, chloroform, 4-methyl-2-pentanone, and acetone.

All detected tentatively identified compounds (TICs) were qualified as presumptively identified at estimated concentrations (JN), or at estimated detection limits (UJN).

2.8 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and reported detection limits were recalculated for the samples specified by Westinghouse Hanford for each case to verify that they were accurate and consistent with CLP requirements. The calculations were consistent with the reported results. Therefore, no changes or qualifications were made based on the calculations.

Below the CRQL, instrument precision becomes more variable as the instrument detection limit (IDL) is approached. Therefore, the concentration of any compound that was detected below the CRQL was qualified as an estimate (J).

2.9 SYSTEM PERFORMANCE ACCEPTABLE

A thorough review of ongoing data acquisition and instrument performance criteria was made to assess overall GC/MS instrument performance. No changes in instrument performance were noted that would result in the degradation of data quality. No indications of unacceptable instrument performance (i.e., shifts in baseline stability, retention time shifts, extraneous peaks, sensitivity) were found during the quality assurance review.

2.10 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. The following changes were made after the submittal of the Preliminary QA Report:

- Detection limits were raised for the compounds in two samples that had been qualified due to blank contamination (WHC 1992a). These samples were B06320 and B062P9. The qualifier assignments remained the same.

No other changes were made to the sample data.

2.11 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the eleven cases discussed above, seven additional Second Round Groundwater volatile organic data packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 2-2. In no case were key deliverables noted to be missing.

ROUND2.FR

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	*B062R3	*B062C7	*B062N1	*B06302	*B06349	*B06350	*B062R7	*B062V8
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene	88	10 U	10 U	10 U	10 U	10 U	5 U	5 U
Trichloroethene	11	10 U	10 U	10 U	10 U	10 U	5 U	4 J
Tetrachloroethene	5 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U
Additional Compounds Originally Detected in Sample:								
Acetone	10 U	NR	18	22	NR	22	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	NR	5 J	NR	5 J	NR	1 J	NR	4 J
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR	NR
4-Methyl-2-pentanone	10 UJ	2 J	NR	NR	2 J	2 J	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	5 UJ	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	NR	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	*B062V4	*B062B5	B06331	B06330	B06329	B06328	B06327	*B062M2	*B062L9
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	5 U	12 U	10 U	57 U	10 U	10 U	15 U	12 U
1,2-Dichloroethene	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	2 J	1 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:									
Acetone	NR	10 U	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	4 J	NR	1 J	1 J	1 J	1 J	1 J	NR	NR
1,1,1-Trichloroethane	NR	NR	10 U	NR	10 U	10 U	10 U	NR	NR
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	2 J	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	NR	NR	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	*B062K7	*B062K4	B062H9	B062D3	B062F5	B062P0	B062R5	B062V2
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	14 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	3 J	2 J	10 U	10 U	3 J
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	NR	0.9 J	NR	25 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	10 U	NR	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	3 J	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	3 J	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	2 J	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	1 J	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	2 J	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	8 UJN	7 UJN	7 UJN
Total subst. alkanes (TIC)	NR	NR	NR	NR	NR	8 JN	NR	NR
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B062V6	B062W4	B062W8	B062X4	B062Z5	B06317	B06362	*B063N3	*B063N4
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5 J	1 J	2 J	3 J	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:									
Acetone	NR	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	NR	NR	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	6 UJN	NR	NR	NR	NR	7 UJN	NR	NR	7 UJN
Total subst. alkanes (TIC)	NR	NR	NR	NR	NR	6 JN	NR	6 JN	NR
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B063N5	*B063N6	B063N7	B063N8	B063N9	B063P0	B063P2	*B062B4
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	17 U	10 U	10 U	10 U	10 U	10 U	70 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	37	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	NR	10 U
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	1 J	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	7 UJN	6 UJN	6 UJN	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	10 UJN
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B062P3	*B062S2	B06320	*B063P3	B063P4	B063P5	B063P6	B062L0
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	68 U	68 U	73 U	66 U	70 U	70 U	80 U	10 U
1,2-Dichloroethene	10 U	5 J	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 J
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	2 J	NR	NR	NR
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NR
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	4 J	1 J	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	NR	10 UJ	9 UJN	11 UJN	10 UJN	NR	10 UJN	19 UJN
Total unknown alkanes (TIC)	9 JN	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	10 JN	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B062L3	B062N4	B062P6	*B062P9	B062Q2	B062Q5	B062Z4	*B06308
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	ug/L	ug/L
Methylene Chloride	10 U	10 U	13 U	12 U	17 U	17 U	10 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	NR	10 U	10 U	10 U	10 U	NR	NR	10 U
1,1,1-Trichloroethane	2 J	NR	NR	NR	NR	NR	NR	NR
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	5 J	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	1 J	NR	NR	NR	NR	1 J	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	9 UJN	NR	21 UJN	12 UJN	27 UJN	20 UJN	NR	NR
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	6 JN	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B06348	B06354	B06355	B06356	B06357	B06358	B06359	B062Z0
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U	18 U	16 U	15 U	16 U	58 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:								
Acetone	NR	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR	2 J
4-Methyl-2-pentanone	NR	2 J	3 J	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	1 J	1 J	NR	1 J	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR	8 JN
Total subst. alkanes (TIC)	NR	32 UJN	NR	36 UJN	16 UJN	14 UJN	31 UJN	24 UJN
Total unknown alkanes (TIC)	6 JN	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	9 JN	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B06360	*B062S9	*B062T2	*B062T5	*B06305	B06351	B06352	B06353	B062W1
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	49 U	18 U	15 U	19 U	10 U	14 U	19 U	15 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4 J
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:									
Acetone	NR	18	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	10 U	5 J	4 J	5 J	NR	4 J	4 J	4 J	7 J
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR	NR	2 J
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	NR	NR	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	7 JN	NR	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	15 UJN	7 JN	NR	NR	NR	NR	NR	NR	16 JN
Total unknown alkanes (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR	NR	NR	NR	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	*B062X1	B062X8	B062Y4	B062Y7	*B06311	B06361	B06363
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	7 J	4 J	10 U	10 U	6 J	10 U	10 U
Tetrachloroethene	10 U	10 U	4 J	10 U	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:							
Acetone	NR	NR	NR	NR	NR	NR	NR
Carbon Disulfide	NR	NR	NR	NR	NR	NR	NR
Chloroform	9 J	8 J	NR	NR	10	NR	NR
1,1,1-Trichloroethane	NR	NR	NR	NR	NR	NR	NR
4-Methyl-2-pentanone	NR	NR	NR	NR	NR	NR	NR
2-Hexanone	NR	NR	NR	NR	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR	NR	NR	NR	NR
Toluene	NR	NR	NR	NR	NR	NR	NR
Xylene (total)	NR	NR	NR	NR	NR	NR	NR
Hexane (TIC)	NR	NR	NR	NR	NR	NR	NR
Total subst. alkanes (TIC)	14 JN	NR	18 JN	NR	NR	13 JN	11 JN
Total unknown alkanes (TIC)	NR	NR	6 UJN	NR	7 UJN	5 UJN	5 UJN
Total unknown hydrocarbons (TIC)	NR	14 JN	NR	5 JN	NR	NR	NR

NR - not reported as detected
* - fully validated sample

Table 2-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Analysis and Qualifier Summary

Sample No.	B063M5	B063M6	B063M7
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L
Methylene Chloride	10 U	10 U	10 U
1,2-Dichloroethene	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U
Additional Compounds Originally Detected in Sample:			
Acetone	NR	NR	NR
Carbon Disulfide	NR	NR	NR
Chloroform	NR	NR	NR
1,1,1-Trichloroethane	NR	NR	NR
4-Methyl-2-pentanone	NR	NR	NR
2-Hexanone	NR	NR	NR
1,1,2,2-Tetrachloroethane	NR	NR	NR
Toluene	NR	NR	NR
Xylene (total)	NR	NR	NR
Hexane (TIC)	NR	NR	NR
Total subst. alkanes (TIC)	16 JN	6 JN	9 JN
Total unknown alkanes (TIC)	NR	NR	NR
Total unknown hydrocarbons (TIC)	NR	NR	NR

NR - not reported as detected
* - fully validated sample

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Table 2-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic
Data Package Completeness Verification Results

Data Package Item	Case Number						
	04-077	04-045	04-070	04-083	06-039	04-072	05-043
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary							
Surrogate Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS/MSD Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blank Summary Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GC/MS Tuning Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Data							
Sample Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TIC Reports For Each Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC Reports for All Samples	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantitation and Calculation Data-All TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data							
Initial Calibration Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Initial Calibration	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continuing Calibration Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports-Cont. Calibration	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Internal Standard Summary report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw QC Data							
Tuning Report, Spectra, Mass Lists	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blank Analysis Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TIC Reports for all Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and quantitation reports for blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Spectra-Detected Results in Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw and Corrected Library Search-Rep. TIC	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quantitation and Calculation Data-TIC	Yes	N/A	Yes	Yes	Yes	Yes	Yes
MS/MSD Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
RIC and Quantitation Reports for MS/MSD	Yes	N/A	Yes	Yes	Yes	Yes	Yes
Additional Data							
Moisture, %Solids Data Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Time Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample Preparation Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No	No	No	No

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3.0 PESTICIDE AND PCB DATA VALIDATION AND LIMITATIONS

3.1 SUMMARY

3.1.1 Eight Sample Delivery Groups

Sample results from the following eight pesticide and PCB cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	A205003	3	2
TMA	A204064	5	4
TMA	A205049	10	0
TMA	A205072	4	0
TMA	A205007	4	4
TMA	A205017	8	2
TMA	A205025	1	0
TMA	A205032	6	2

Data qualifiers assigned to the 300-FF-5 compound of concern (Aroclor 1248) are summarized in Table 3-1. No compounds were detected in these samples.

3.1.2 All Samples Validated

Results for all the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. For case A205007 one hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all results were recalculated from the laboratory raw data). All of the reported results for quality assurance samples associated with these cases were reviewed.

3.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedures for Chemical Analyses (WHC 1992a). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), and the EPA's Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses (EPA 1988b).

3.1.4 Samples Analyzed According to CLP Protocols

Forty-one low level water samples were submitted for analysis. Analyses were performed according to the 1990 CLP protocol (EPA 1990). Sample analyses were performed using gas chromatography/ electron capture detection (GC/ECD) systems. Failure to comply with various technical requirements established by CLP protocols resulted in qualification of the data. The specific problems observed during the quality assurance review, and the associated data qualifications, are detailed in the sections below.

3.1.5 Most Data Quality Objectives Met

The analyses were complete and overall met the method and work plan requirements.

3.1.6 Minor Deficiencies

There were minor deficiencies noted with the analyses. These include: exceeded holding times, minor retention time shifts, minor calibration verification exceedences, use of wrong standard to make a calculation (one instance), minor percent difference exceedences between the two columns. These deficiencies and the resulting data qualifications are explained in greater detail below.

3.2 ANALYTICAL METHOD

3.2.1 Instrument Performance

Instrument performance was assessed to ensure that adequate chromatographic resolution and instrument sensitivity were achieved by the gas chromatographic system.

The specific criteria for acceptable instrument performance are outlined in EPA guidelines (EPA 1990), including the evaluation and qualification procedures that may be performed on the analytical results.

During the quality assurance review, all indicators for acceptable instrument performance were verified. The criteria established by CLP protocols were met and the results were acceptable, except as noted.

3.2.2 Instrument Calibration Acceptable

Instrument calibration is performed to ensure that the chromatographic system is capable of producing acceptable and reliable analytical data. The initial calibrations and calibration verifications are to be performed according to procedures established by CLP protocols (EPA 1990). An initial calibration is performed prior to sample analysis to establish the linear range of the system, including a demonstration that all target compounds can be detected and reported at their contract required quantitation limit. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day-to-day basis.

A detailed description of the results for the initial calibration and calibration verification is presented below.

3.2.2.1 Initial Calibrations Acceptable

Resolution of Standard Peaks Acceptable. The laboratory performs resolution check standard analyses prior to multicomponent and target pesticide initial calibrations. The resolution between two adjacent peaks in the resolution check mixture must be greater than 60 percent. In addition to the resolution check standard criteria there are criteria for resolution between calibration standard peaks. Resolution of all peaks in the performance evaluation mixtures (PEM) must be 100 percent. Resolution between any two adjacent peaks in the midpoint individual calibration mixes A and B (INDA and INDB) must be greater than or equal to 90 percent. If the resolution criteria are not met, positive sample results generated after the initial calibration are rejected (R).

The laboratory performed resolution check standard analyses at the required frequency and the results were acceptable. Therefore, no data were qualified based on the resolution check standard results.

Multicomponent Calibrations Acceptable. After the resolution check standard and prior to the linearity check, the laboratory performs the initial calibration for multicomponent analytes. There are no performance criteria associated with the initial calibration.

The multicomponent calibrations were performed at the required frequency and are acceptable. Therefore, no data were qualified based on the multicomponent calibration results.

Linearity Checks Acceptable. The laboratory performs an initial multipoint calibration for all of the pesticide target compounds and both specified surrogate compounds at the concentrations required by CLP protocols. According to the 1990 SOW, the linearity of the initial calibration is established when the percent relative standard deviation (RSD) of the calibration factors is less than or equal to 20 percent for the target pesticide compounds, and less than or equal to 30 percent for both surrogate compounds. Up to two target compounds may exceed the 20 percent criteria, but must be less than or equal to 30 percent.

According to the Westinghouse Hanford data validation procedures (WHC 1992a, p.33), the RSD values of the calibration factors for alpha-BHC, beta-BHC, gamma-BHC, DDT, endrin, and methoxychlor must be less than 15 percent. The RSD values for all other single component pesticides and surrogates must be less than 10 percent. If the RSD criteria are not met, all positive sample results associated with the calibration are qualified as estimates (J).

The more restrictive linearity criteria were met for these eight cases with the following exceptions:

Case A205003. On column DB-608 there were the following exceedences: delta-BHC (18.8 percent), aldrin (11.6 percent), dieldrin (14.4 percent), 4,4'-DDE (14 percent), and 4,4'-DDD (18.5 percent); on column DB-1701 there were the following exceedences: delta-BHC (14.6 percent), and 4,4-DDD (14.1 percent). No qualifiers were assigned based on these exceedences.

Case A204064. On column DB-608 there were the following exceedences: aldrin (11.6 percent), heptachlor epoxide (11.9 percent), endosulfan I (10.7 percent), endosulfan II (15.9 percent), endosulfan sulfate (16.3 percent), methoxychlor (17 percent), and endrin aldehyde (22.4 percent). On column DB-1701 there were the following exceedences: alpha-BHC (16 percent), delta-BHC (10.7 percent), heptachlor epoxide (13.4 percent), and endrin aldehyde (11.2 percent). No qualifiers were assigned based on these percent RSD.

Case A205049. On column DB-608 there were the following exceedences: alpha-BHC (28 percent), delta BHC (18.9 percent), gamma-BHC (22.1 percent), and 4,4'-DDD (15.8 percent). On column DB-1701 there were the following exceedences: delta-BHC (26.3 percent), aldrin (12.8 percent), dieldrin (14.5 percent), 4,4'-DDE (14.8 percent), and methoxychlor (19.2 percent). No qualifiers were assigned based on these percent RSD.

Case A205072. On column DB-608 there were the following exceedences: alpha-BHC (24.8 percent), delta-BHC (20.5 percent), and gamma-BHC (18.8 percent). On column DB-1701 there were the following exceedences: aldrin (15.8 percent), dieldrin

(14.6 percent), 4,4'-DDE (17.4 percent), and methoxychlor (19.5 percent). No qualifiers were assigned based on these exceedences.

Case A205007. On column DB-608 there were the following exceedences: alpha-BHC (27.1 percent), delta-BHC (23.8 percent), gamma-BHC (21.4 percent), aldrin (10.7 percent), 4,4'-DDE (12.4 percent), 4,4'-DDD (14.2 percent), and endrin aldehyde (10.6 percent). On column DB-1701 there were the following exceedences (alpha-BHC (18.7 percent), delta-BHC (12.5 percent), gamma-BHC (16.4 percent), aldrin (21.4 percent), 4,4'-DDE (19.4 percent), 4,4'-DDD (14.9 percent), hepachor epoxide (15.7 percent), endosulfan I (16.2 percent), dieldrin (21.5 percent), endrin (23.7 percent), and alpha chlordane (10.5 percent). More than 2 compounds exceeded the 20 percent criteria. Because no compounds were detected, no data qualifiers were assigned.

Case A205017. On column DB-608 there were the following exceedences: alpha-BHC (27.1 percent), delta-BHC (23.8 percent), gamma-BHC (21.4 percent), aldrin (10.7 percent), 4,4'-DDE (12.4 percent), 4,4'-DDD (14.4 percent), and endrin aldehyde (10.6 percent). On column DB-1701 there were the following exceedences: alpha-BHC (18.7 percent), delta-BHC (12.5 percent), gamma-BHC (16.4 percent), aldrin (21.4 percent), heptachlor epoxide (15.7 percent), endosulfan I (16.2 percent), dieldrin (21.5 percent), 4,4'-DDE (19.4 percent), endrin (23.7 percent), 4,4'-DDD (14.9 percent), and alpha chlordane (10.5 percent). More than 2 compounds exceeded the 20 percent criteria. Because no compounds were detected, no data qualifiers were assigned.

Case A205025. On column DB-608 there were the following exceedences: alpha-BHC (27.1 percent), delta-BHC (23.8 percent), gamma-BHC (21.4 percent), aldrin (10.7 percent), 4,4'-DDE (12.4 percent), 4,4'-DDD (14.4 percent), and endrin aldehyde (10.6 percent). On column DB-1701 there were the following exceedences: alpha-BHC (18.7 percent), delta-BHC (12.5 percent), gamma-BHC (16.4 percent), aldrin (21.4 percent), heptachlor epoxide (15.7 percent), endosulfan I (16.2 percent), dieldrin (21.5 percent), 4,4'-DDE (19.4 percent), endrin (23.7 percent), 4,4'-DDD (14.9 percent), and alpha chlordane (10.5 percent). More than 2 compounds exceeded the 20 percent criteria. Because no compounds were detected, no data qualifiers were assigned.

Case A205032. On column DB-608 there were the following exceedences: alpha-BHC (24.8 percent), delta-BHC (20.5 percent), gamma-BHC (18.8 percent), 4,4'-DDE (12.1 percent), and 4,4'-DDD (13 percent). On column DB-1701 there were the following exceedences: aldrin (15.8 percent), dieldrin (14.6 percent), 4,4'-DDE (17.4 percent), and methoxychlor (19.5 percent). No qualifiers were assigned based on these exceedences.

3.2.2.2 Calibration Verification Acceptable

There are three calibration verification standards which are used to verify calibrations and evaluate instrument performance: PEM, INDA, and INDB. The analytical results for the PEM, INDA, and INDB mixtures must have a relative percent difference (RPD) of less than or equal to 25 percent from the true value. In addition, sample data are not acceptable unless bracketed by PEM, INDA, and INDB verification standard analyses that meet these criteria. If the RPD criteria are not met all associated positive sample results are qualified as estimates (J).

The RPD criteria were met for these eight cases, with the following exceptions:

Case A205003. One of the six INDA mixes had minor exceedence: endosulfan I (25.4 percent), dieldrin (26 percent), endrin (27 percent), 4,4'-DDD (28 percent), and 4,4'-DDT (26 percent). As these exceedences were minor, all other INDA mixes run in this analytical sequence were acceptable, and the samples were bracketed by acceptable INDA mixes, no qualifiers were assigned based on the calibration verification standard exceedences.

Case A205049. Two of the four INDB mixes had minor exceedences: delta-BHC (40.4 and 32.4 percent). As these exceedences were minor, all other INDB mixes run in this analytical sequence were acceptable, and the samples were bracketed by acceptable INDB mixes, no qualifiers were assigned based on the calibration verification standard exceedences.

3.2.3 DDT and Endrin Breakdown Acceptable

Breakdown of 4,4'-DDT and endrin in the PEM must be less than or equal to 20 percent individually, or less than or equal to 30 percent, combined.

If the DDT percent breakdown exceeds 20 percent, positive DDT results are qualified as estimates; DDT non-detects are qualified as rejected (R) if DDD or DDE are detected; if detected, DDD and DDE are qualified as estimates and presumptive evidence (JN).

If the endrin percent breakdown exceeds 20 percent, positive endrin results are qualified as estimates; endrin non-detects are qualified as rejected (R) if endrin aldehyde, or endrin ketone are detected; if detected, endrin aldehyde and endrin ketone are qualified as estimates and presumptive evidence (JN).

The breakdown criteria were met in all instances associated with these eight cases. Therefore, no qualifiers were assigned based on the breakdown information.

3.2.4 Retention Time Criteria Acceptable

Retention times for each of the single component pesticides and surrogates in PEMs, INDA, INDB, and in the three calibration standards must be within ±0.02 minute of the initial calibration mean retention times with the exception of methoxychlor, which must be within ±0.025 minute.

If the retention time criteria are not met and no peaks are present in the samples within two times the retention time windows, no qualification is necessary. If peaks are present in samples outside the retention time window a review is made of the raw data to determine if expanded retention time windows are called for. Qualification of data in these circumstances is specified in Westinghouse Hanford (WHC 1992a).

Retention time criteria were met for all samples and standards associated with these eight cases, with the exception of the following:

Case A205003. There were minor retention time exceedences early on in the analytical sequence. All retention times met the expanded criteria, and the samples and standards bracketing them had acceptable retention times. All sample results were non-detects. Therefore, no qualification of the data was made based on the retention times.

Case A204064. There were minor retention time exceedences in the analytical sequence. All retention times met the expanded criteria, and the samples and standards bracketing them had acceptable retention times. All sample results were non-detects. Therefore, no qualification of the data was made based on the retention times.

Case A205007. There were two minor retention time exceedences in the sequence. Retention times met the expanded criteria. All sample results were non-detects. Therefore, no qualification of the data was made based on the retention times.

3.2.5 Analytical Sequence Acceptable

Sample analysis and instrument calibration must be performed in the sequence established by CLP protocols.

For all eight cases the analytical sequence was executed as specified in the CLP protocol.

3.2.6 Instrument Blank Analyses Acceptable

An instrument blank consisting of hexane or iso-octane spiked with surrogate compounds must be analyzed at the beginning of each 12-hour sample analysis sequence

and all acceptable sample analyses must be bracketed by acceptable instrument blanks. The instrument blank must not contain any target compound at a concentration of greater than 0.5 times the CRQL. If target compounds are present in the instrument blanks all associated positive sample results that are 5 times the highest amount detected in any instrument blank are qualified as nondetects (U).

No compounds were detected in the instrument blanks. Therefore, no data were qualified based on the instrument blanks.

3.2.7 Gel Permeation Chromatography Not Required

There were no GPC cleanups needed or performed with these samples. No data were qualified based on the lack of GPC calibration check standards.

3.2.8 Florisil Cartridge Check Acceptable

Cartridge performance checks must be conducted on every lot of florisil cartridges used for cleanup. Recovery of each evaluation compound must be within the limits of 80 to 110 percent, recovery of trichlorophenol must be less than 5 percent, and no interfering peaks must be present within or near the retention windows for the target pesticides. If evaluation compound recoveries are outside the limits of 80 to 110 percent, all associated sample results are qualified as estimated (J or UJ). If trichlorophenol recovery greater than 5 percent and interfering peaks are present, the results are noted.

The florisil cartridge checks met all performance criteria. Therefore, no qualifiers were assigned based on the florisil performance checks.

3.3 HOLDING TIMES

Analytical holding times were assessed to ascertain whether the CLP holding time requirements for pesticide/PCB analyses were met by the laboratory. The CLP holding time requirements for pesticide/PCB analyses are as follows: water samples must be extracted within 7 days of the date of sample collection; all extracts must be analyzed within 40 days of extraction; all samples must be shipped on ice to the laboratory and stored at 4°C until extraction; and the extracts must be stored at 4°C until analysis.

Holding times for samples associated with these eight cases were met, with the following exception:

Case A205032. All samples associated with this case were analyzed 5 days outside the holding times and were therefore qualified as estimates (UJ).

3.4 BLANKS

3.4.1 Method Blank Analysis

For each matrix analyzed and each instrument used, a method blank must be analyzed on the following frequency: each case, each 14 day period in which samples are received in the case, each 20 samples of similar matrix in the case, or whenever samples are extracted by the same procedure. If target compounds are present in the method blanks, all associated positive sample results that are less than 5 times the highest amount in any blank are qualified as undetected (U).

No target compounds were detected in the method blanks.

3.4.2 Field Blank Analyses

No target compounds were detected in the field blanks.

3.5 ACCURACY

Accuracy was assessed by evaluating the recoveries of the surrogate compounds and the matrix spike recoveries calculated for the sample analyses. The overall accuracy goal for the compound of concern (Aroclor-1248) is ± 25 percent. Both sets of results are discussed below.

3.5.1 Surrogate Compound Recoveries Acceptable

The CLP-specified surrogates, decachlorobiphenyl (DCB) and tetrachloro-m-xylene (TCMX) were used for all sample analyses. The recovery for DCB and TCMX must be within the established acceptable quality control limits of 60 to 150 percent (EPA 1990). For one case (A205007), and for samples specified by Westinghouse Hanford, surrogate recoveries for DCB and TCMX were recalculated and verified during the quality assurance review.

Surrogate percent recoveries were acceptable, with the following exceptions:

Case A205049. Sample B062W4 had a slightly low percent recovery of TCMX (56 percent). Because the DCB percent recovery in sample B062W4 was acceptable and the exceedence was only minor, no qualification of the sample data were made.

Case A205007. Sample B062T5 has a slightly low percent recovery of TCMX (59 percent). Because the DCB percent recovery in sample B062T5 was acceptable and the exceedence was only minor, no qualification of the sample data were made.

Case A205017. Sample B062L3 had low recoveries of both DCB (66 and 59 percent) and TCMX (58 and 55 percent) on both columns. Therefore, all associated sample data (B062L3) were qualified as having estimated detection limits (UJ).

3.5.2 Matrix Spike Recoveries Acceptable

Matrix spike analyses are performed in duplicate using six compounds specified by CLP protocols. The recoveries for the six compounds must be within the acceptable quality control limits established by CLP protocols.

There were eight matrix spike samples (B062C7, B062L9, B062D3, B062P3, B062T5, B062L0, B062Z0, and B062W1) associated with these eight cases. The matrix spike percent recoveries were acceptable and ranged from 60 to 116 percent, with the following exception:

Case A205049. Endrin percent recovery was 125 percent, and was slightly outside the control window. No qualifiers were assigned based on matrix spike results alone.

3.6 PRECISION ACCEPTABLE

Precision is expressed as the relative percent difference (RPD) between the recoveries of the duplicate analyses performed (i.e., matrix spike duplicates, field duplicates, and field split samples). The overall precision goal for the compound of concern is ± 20 percent.

3.6.1 Matrix Spike Duplicates Acceptable

The RPDs were acceptable for the MS/MSD analyses associated with these eight cases and ranged from 1 to 20 percent, with the following exceptions:

Case A205003. Percent RPDs were exceeded for two compounds in matrix spike sample B062C7: gamma-BHC (36 percent), and heptachlor (32 percent). No qualifiers were assigned based on the matrix spike data alone.

3.6.2 Field Duplicates Analyzed

There were four sets of field duplicate samples analyzed for pesticides and PCBs (B06302 and B062C7 of Case A205003; B06305 and B062T2 of Case A205007; B06308 and B062P9 of Case A205017; and B06311 and B062X1 of Case A205032).

For each of these samples the compound of concern (Aroclor 1248) and all other compounds were not detected. Therefore, field duplicate precision could not be evaluated.

Full presentation of field duplicate data and RPD calculations are given in Appendix A.

3.6.3 No Interlaboratory Precision Data

There were field split samples analyzed, but the Weston data has not yet been received for review. Therefore, interlaboratory precision could not be evaluated. No qualifiers were assigned because of this lack of interlaboratory precision data.

3.7 IDENTIFICATION OF COMPOUNDS

The data were evaluated to confirm the positive concentrations and to investigate the possibility of false negatives in all other data. Confirmation of possible false negatives is addressed by reviewing other factors relating to analytical sensitivity (e.g., detection limits, instrument linearity, analytical recovery). These factors were found to be in control, and the data are acceptable.

No compounds were detected in Cases A205003, A204064, A205049, A205072, A205007, A205017, A205025, and A205032.

3.8 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and reported detection limits were recalculated and verified for the samples specified by Westinghouse Hanford to ensure that they were accurate and consistent with CLP requirements (EPA 1990). The reported detection limits must be in accordance with the CRQLs specified in the applicable CLP statement of work.

The compound quantifications and the CRQLs reported were calculated correctly and were acceptable.

3.9 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. The following change was made after the submittal of the Preliminary QA Report:

- The Form I for sample B062P6 was added to the supporting documentation filed with Case A205017. Originally this samples Form I was missing from the data package. In response to our request it was provided by Westinghouse Hanford on November 23, 1992, but was inadvertently left out of the Preliminary QA Report.

- No other changes were made to the sample data qualifiers or documentation.

3.10 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the eight pesticide/PCB cases discussed above, seven additional Second Round Groundwater pesticide/PCB packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 3-2. In no case were key deliverables noted to be missing.

Table 3-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Pesticide and PCB Compounds Analysis and Qualifier Summary

Sample No.	*B062C7	*B062N1	B06302	*B062M2	*B062L9	*B062K7	*B062K4	B062H9
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aroclor-1248	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

* - fully validated sample

Table 3-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Pesticide and PCB Compounds Analysis and Qualifier Summary

Sample No.	B062D3	B062F5	B062P0	B062R5	B062V2	B062V6	B062W4	B062W8	B062X4
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aroclor-1248	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

* - fully validated sample

Table 3-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Pesticide and PCB Compounds Analysis and Qualifier Summary

Sample No.	B06317	*B062B4	B062P3	*B062S2	B06320	*B062S9	*B062T2	*B062T5
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aroclor-1248	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

* - fully validated sample

Table 3-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Pesticide and PCB Compounds Analysis and Qualifier Summary

Sample No.	*B06305	B062L0	B062L3	B062N4	B062P6	*B062P9	B062Q2	B062Q5	*B06308
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aroclor-1248	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U

* - fully validated sample

Table 3-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Pesticide and PCB Compounds
Analysis and Qualifier Summary

Sample No.	*B062Z0	B062W1RE	*B062X1RE	B062X8RE	B062Y4RE	B062Y7RE	*B06311RE
300-FF-5 Compounds of Concern:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Aroclor-1248	1 U	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ

* - fully validated sample

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Table 3-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Pesticide/PCB
Data Package Completeness Verification Results

Data Package Item	Case Number						
	04-077	04-045	04-070	04-083	06-039	04-072	05-043
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary							
Surrogate Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS/MSD Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Blank Summary Report	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Data							
Sample reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chromatograms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GC Integration Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Worksheets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
UV Traces from GPC	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GC/MS Confirmation Spectra	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Standards Data							
Pesticides Evaluation Standards Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pesticide/PCB Standards Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pesticide/PCB Identification	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pesticides Standard Chromatogram	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw QC Data							
Blank Analysis Report Forms and Chrotomatograms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MS/MSD Report Forms and Chromatograms	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Data							
Moisture, %Solids Data Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Time Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Sample Preparation Sheets	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality	No	No	No	No	No	No	No

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4.0 METALS DATA VALIDATION AND LIMITATIONS

4.1 SUMMARY

4.1.1 Nine Sample Delivery Groups

Sample results from the following nine metals cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	N204159	6	3
Weston	9205L332	3	3
Weston	9205L406	1	1
TMA	N204110	10	5
TMA	N205094	20	8
TMA	N205146	8	6
TMA	N205023	18	4
TMA	N205016	8	6
TMA	N205055	12	4

Data qualifiers assigned to the 300-FF-5 compound of concern (aluminum, antimony, beryllium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, silver, and zinc) and for all other compounds originally reported as detected for these cases are summarized in Table 4-1.

4.1.2 All Samples Validated

Results for all the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. All of the reported results for quality assurance samples associated with these cases were reviewed. For case N205016 one hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

4.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedures for Chemical Analyses (WHC 1992a). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), and the EPA's Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses (EPA 1988c).

4.1.4 Samples Analyzed According to CLP Protocols

Eighty-six low level groundwater samples were submitted for analysis for inorganic target analyte list (TAL) metals, with the exception of Weston Cases 9205L332 and 9205L406, which were not analyzed for lead, arsenic, selenium, thallium, and mercury. Analyses were performed according to the 1988 CLP protocol (EPA 1988c) or the 1990 CLP protocol (EPA 1990).

Samples were analyzed using an inductively coupled argon plasma emission spectrometer (ICP), a graphite furnace atomic absorption spectrometer (GFAA), and a cold vapor atomic absorption spectrophotometer (CVAA). Failure to comply with various technical requirements established by CLP protocols resulted in qualification of the data.

4.1.5 Most Data Quality Objectives Met

The analyses were complete and met the method and work plan contract required detection limit (CRDL) requirements (DOE 1990), except as noted below.

4.1.6 Major Deficiencies

Selenium data in Case N204110 and thallium data for SDG B062W1 (samples B062W1, B062X1, B062X8, B062Y4, B062Y7, and B06311) in Case N205055 were qualified as rejected (R) due to 0 and 17 percent recovery of the matrix spike associated with the cases, respectively.

4.1.7 Minor Deficiencies in Other Qualified Data

There were minor deficiencies associated with the analysis of these samples. Minor deficiencies included minor blank contamination; matrix spike percent recovery exceedences; low calibration correlation coefficients; analytical spike percent recovery exceedences; instruments not defaulting at IDL values; and ICP serial dilution RPD exceedences.

Also, the minimum detection limit requirements were not met for mercury and zinc. The mercury detection limit requirement was 0.1 μg/L. In all cases the laboratory reported 0.2 μg/L. The zinc detection limit requirement was 5 μg/L. For these samples, the laboratory reported a 6 to 18 μg/L detection limit for zinc.

These deficiencies and the resulting data qualifications are explained in greater detail below.

4.2 ANALYTICAL METHODS

Performance of specific instrument quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are outlined below.

4.2.1 Instrument Calibration Acceptable Except for Arsenic and Selenium

4.2.1.1 GFAA

Four calibration standards and a blank were analyzed for arsenic, selenium, thallium, and lead by GFAA. The correlation coefficient of a least squares linear regression met the requirements for calibration except for the following cases.

Case N204159. There were two sets of selenium data associated with this case. The correlation coefficient for selenium (0.987 and 0.9914, respectively) in both instrument calibrations were less than 0.995. Therefore, the associated selenium data (B062N2, B06302, B06303, B062C7, B062C8, and B062N1) were qualified as estimates (J) or as having estimated detection limits (UJ).

Case N205094. The correlation coefficient for selenium (0.9821) was less than 0.995. Therefore, the associated selenium data (B06317 and B062D3) were qualified as having estimated detection limits (UJ).

Case N205023. The correlation coefficients for selenium (0.993) and arsenic (0.992) were less than 0.995. Therefore, the associated selenium and arsenic data (B062L1, B062L4, B062N5, B062P7, B062Q0, B062Q3, B062Q6, B062Z1, and B06309) were qualified as estimates (J) or as having estimated detection limits (UJ).

Case N205016. The correlation coefficient for selenium (0.980) was less than 0.995. Therefore, the associated selenium data (B06305, B06306, B062S9, B062T0, B062T2, B062T3, B062T5, and B062T6) were qualified as estimates (J) or as having estimated detection limits (UJ).

Case N205055. The correlation coefficients for the three selenium calibrations (0.992, 0.993, and 0.993) were less than 0.995. Therefore, the associated selenium data (B06311, B06312, B062W1, B062X1, B062X8, B062Y4, B062Y7, B062W2, B062X2, B062X9, B062Y5, and B062Y8) were qualified as estimates (J) or as having estimated detection limits (UJ).

4.2.1.2 CVAA

Up to five calibration standards and a blank were analyzed for mercury by CVAA. The correlation coefficient of a least squares linear regression met the requirements for calibration.

4.2.1.3 ICP

At least one standard and a blank were analyzed by ICP for all other elements, and the calibration was acceptable.

4.2.2 Calibration Verification Acceptable

The above calibrations were each immediately verified with an initial calibration verification (ICV) standard and a calibration blank. The ICV was prepared from a source independent of the calibration standards, at a mid-calibration range concentration. The ICV percent recovery must fall within the control limits of 90 to 110 percent for metals analyzed by ICP and GFAA, and 80 to 120 percent for mercury. Calibration linearity near the detection limit was verified with a standard prepared at a concentration near the CRDL. The ICVs met the recommended control limits in all cases.

The calibrations were subsequently verified at regular intervals using a continuing calibration verification (CCV) standard. The control windows for percent recovery of CCV standards are the same as the ICV windows described above. The CCVs met the recommended control limits in all cases.

4.2.3 Low Level Blank Contamination

Initial calibration blank (ICB), continuing calibration blank (CCB) and preparation or method blank (PB or MB) results were reviewed to determine the extent of variability of the sample detection limit and the existence and magnitude of blank contamination.

Samples with digestate concentrations (in $\mu g/L$) of less than five times the highest amount found in any of the associated blanks are qualified as non-detected (U). Samples with concentrations of greater than five times the highest amount found in any of the associated blanks do not require qualification.

Several elements were detected in blanks associated with these nine cases. Listed in the appendices on Form B-3 are the maximum concentration of elements found in all laboratory blanks associated with these cases and the qualifiers assigned. These qualifications are also outlined below.

In both of the Weston cases (9205L332 and 9205L406) the instruments did not default to the reported IDL. The default values were lower than the CRDLs. Defaulting to non-CLP IDL is not technically incorrect. Therefore these default values were used in place of the reported IDLs to make the data qualifications.

Case N204159. The aluminum concentration reported for sample B062N1; the copper and manganese concentrations reported for samples B062C7, B062C8, B06302, and B06303; and the vanadium concentrations for samples B062C8 and B06302 were qualified as not detected above the associated detection limits (U).

Case 9205L332. The vanadium concentrations reported for samples B062X6, B062W6, and B062V9 were qualified as not detected above the associated detection limits (U).

Zinc values reported for the prep blank were negative. The sample data were evaluated. A negative bias would affect non-detects and low level zinc concentrations, such as in samples B062X6 and B062W6. Therefore, the zinc concentrations for these samples were qualified as estimates (J).

Case 9205L406. No qualifications were made based on the blank results.

Case N204110. The silver concentrations reported for samples B062J0, B062K7, B062K8, B062M0, and B062M3; and iron concentrations reported for samples B062K5, B062K8, B062L9, and B062M0 were qualified as not detected above the associated detection limits (U).

Arsenic values reported for the prep blank were negative. The sample data were evaluated. A negative bias would affect non-detects and low level arsenic concentrations, such as in samples B062J0 and B062H9. Therefore, the arsenic concentrations for these samples were qualified as estimates (J).

Case N205094. The aluminum concentrations reported for samples B062P1, B062R6, B062V3, B062W5, B062D4, B062F6, B062W9, and B062X5; cadmium in sample B062P1; calcium in sample B06318; iron in samples B062P1, B062W5, and B062W9; manganese in samples B062P1, B062V3, B06318, B062D4, B062F6, B062W5, B062W9, and B062X5; sodium in sample B06318; vanadium in samples B062D4, B062X5, B062F6, B062D3, B062F5, B062P0, B062W8, B062X4, B062V2, and B062V6; and zinc in samples

B062D4, B062F6, B062P1, B062V3, B062V7, B062W5, B062X5, and B06318 were qualified as not detected above the associated detection limits (U).

The chromium value reported for the prep blank was negative. The sample data were evaluated. A negative bias would affect low level chromium concentrations, such as in sample B062F5. Therefore, the chromium concentration for this sample was qualified as an estimate (J).

Case N205146. The copper concentrations reported for samples B062B6 and B06321; manganese in samples B062B6, B062P4, and B06321; nickel in sample B062P4; and vanadium in samples B062B6 and B062P4 were qualified as not detected above the associated detection limits (U).

The lead value reported for the prep blank was negative. The sample data were evaluated. A negative bias would affect non-detects and low level lead concentrations, such as in sample B062B6. Therefore, the lead concentration for this sample was qualified as an estimate (J).

Case N205023. For sample delivery group (SDG) number B062L0, the aluminum concentrations reported for samples B062P6, B062Q2, and B062Q5; cadmium in sample B062P9; copper in samples B062L3, B062N4, and B06308; vanadium in samples B062L0, B062N4, B062P6, B062P9, B062Q2, B062Q5, B06270, and B06308; manganese in samples B062L0, B062P6, B062P9, B062Q2, B062Q5, and B06270; cobalt in sample B062Q2; iron in samples B062L0, B062P6, B062P9, B062Q5, B06270, and B06308; and arsenic in samples B062L0, B062P9, B062Q2, B062Q5, B06270, and B06308 were qualified as not detected above the associated detection limits (U).

For SDG number B062L1, the arsenic concentrations reported for samples B062L1, B062L9, B062N5, B062P7, B062Q0, B062Q3, B062Q6, B062Z1, and B06309; aluminum in samples B062L4, B062N5, and B062Q3; cadmium in sample B06309; manganese in samples B062L1, B062Q0, B062Q6, B062Z1, and B06309; lead in samples B062L1, B062L4, B062N5, B062Q0, B062Q3, B062Q6, B062Z1, and B06309; iron in samples B062L1, B062L4, B062Q3, B062Q6, B062Z1, and B06309; and vanadium in samples B062L1, B062Q0, B062Q6, B062Z1, and B06309 were qualified as not detected above the associated detection limits (U).

Case N205016. The aluminum concentrations reported for samples B062S9, B062T2, B062T3, and B06305; nickel in samples B062S9, B062T2, B062T5, and B06306; and manganese in sample B062S9 were qualified as not detected above the associated detection limits (U).

Case N205055. For SDG number B062W1, the copper concentrations reported for samples B062X8, B062Y4, and B06311 were qualified as not detected above the associated detection limits (U).

For SDG number B062W2, no samples were qualified based on the blank results.

4.2.4 All Holding Times Met

Analytical holding times for ICP metals, GFAA metals, and CVAA mercury analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: samples must be analyzed within twenty-eight days for mercury; and within six months for all other metals.

— All required holding times were met for all samples in each of these nine cases.

4.2.5 Instrument-Specific Quality Control Procedures

4.2.5.1 ICP

Interference Check Sample (ICS). ICSs were analyzed at the beginning and end of each ICP sample sequence to verify the laboratory interelement and background correction factors. Results for the ICS solution must fall within the control limit of ±20 percent of the true value.

The ICS samples analyzed with these cases were acceptable.

Serial Dilutions. A five-fold serial dilution is required for all elements analyzed by ICP whose concentrations are greater than 50 times the IDL. The subsequent concentrations of the reanalysis are compared with the original analysis. The concentration values must agree within a percent difference (%D) of 10 percent.

A serial dilution was required for many of the ICP metals in these nine cases. The dilution concentrations were found to be within 10%D of the initial analysis except for the following.

Case 9205L332. The serial dilution criteria were exceeded for calcium (11 percent), magnesium (11 percent), and sodium (18 percent). Therefore, calcium, magnesium, and sodium data for samples B062X6, B062W6, and B062V9 were qualified as estimates (J).

Case 9205L406. The serial dilution criteria were exceeded for sodium (11 percent). Therefore, sodium data for sample B062S4 were qualified as estimates (J).

Case N205094. In SDG number B062D3, the serial dilution criteria were exceeded for barium (10.7 percent) and iron (10.8 percent). Therefore, barium and iron data for samples B062D3, B062F5, B062P0, B062R5, B062V2, B062V6, B062W4, B062W8, and B062X4 were qualified as estimates (J).

4.2.5.2 GFAA

Duplicate injections are required for all GFAA analyses. The duplicate injections establish the precision of the individual analytical determinations. For sample concentrations greater than the CRDL, duplicate injections must agree within ±20 percent RSD.

- Duplicate injection frequency requirements were met.

The post-digestion analytical spike is analyzed to determine the extent of interference in the digestate matrix. When the results of the analytical spike analyses exceed the control window of 85 to 115 percent recovery and the absorbance of the sample is greater than fifty percent of the analytical spike absorbance, then the sample must be reanalyzed using the method of standard additions (MSA).

Case N204159. The precision between burns exceeded the 20 percent criteria for lead in sample B062N1; and for arsenic in samples B062C7, B062C8, and B06302. Therefore associated sample results for lead and arsenic in those samples were qualified as estimates (J).

The analytical spike percent recovery of thallium in samples B062C7 (64 percent), B062C8 (62 percent), B062N1 (62 percent), B062N2 (66 percent), B06302 (64 percent), and B06303 (61 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of arsenic in samples B062N1 (116 percent) and B062N2 (122 percent) exceeded the control limit. Arsenic was not detected in the associated samples. Therefore, the associated arsenic detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of selenium in samples B062C7 (123 percent) and B062N2 (43 percent) exceeded the control limit. Selenium was not detected in the associated samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of selenium in sample B062C8 exceeded the control limit. The analytical spike was reanalyzed and again exceeded the control limit. Therefore, the method of standard additions was used to calculate the concentration of selenium in the sample. The MSA correlation coefficient goal of 0.995 was not met (0.9753). Therefore, the concentration of selenium in sample B062C8 was qualified as an estimate (J).

Case 9205L332. There were no metals analyzed by GFAA reported for this case.

Case 9205L406. There were no metals analyzed by GFAA reported for this case.

Case N204110. The precision between burns exceeded the 20 percent criteria for arsenic in sample B062J2; and for lead in samples B062K8, and B062L9. Therefore associated sample results for lead and arsenic in those samples were qualified as estimates (J).

The analytical spike percent recovery of thallium in samples B062L9 (45 percent), B062M0 (49 percent), B062J0 (50 percent), B062H9 (74 percent), B062K4 (52 percent), B062K5 (57 percent), B062K7 (47 percent), B062K8 (54 percent), B062M2 (41 percent), and B062M3 (45 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of arsenic in samples B062M0 (117 percent), B062K7 (67 percent), B062K8 (74 percent), B062M2 (63 percent), and B062M3 (51 percent) exceeded the control limits. Arsenic was not detected in these samples. Therefore, the associated arsenic detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of selenium in samples B062L9 (69 percent), B062M0 (62 percent), B062J0 (42 percent), B062H9 (0 percent), B062K4 (78 percent), B062K7 (58 percent), B062K8 (0 percent), B062M2 (49 percent), and B062M3 (53 percent) exceeded the control limits. Selenium was not detected in these samples. The associated selenium data were qualified as rejected (R) due to matrix spike exceedences. Therefore, no additional qualifiers were assigned.

Case N205094. In SDG number B062D4, the precision between burns exceeded the 20 percent criteria for lead in sample B062V7, and for arsenic in samples B062P1 and B062V7. Therefore, associated sample results for lead and arsenic in those samples were qualified as estimates (J).

The analytical spike percent recovery of lead in samples B062P1 (83 percent), B062V7 (84 percent), B062D4 (84 percent), and B062W9 (82 percent) exceeded the

control limits. Lead was detected in these samples. Therefore, the lead data for these samples were qualified as estimates (J).

The analytical spike percent recovery of thallium in samples B062D4 (54 percent), B062F6 (50 percent), B062P1 (48 percent), B062R6 (45 percent), B062V3 (55 percent), B062V7 (50 percent), B062W5 (56 percent), B062W9 (50 percent), B062X5 (52 percent), and B06318 (84 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of arsenic in sample B062R6 (121 percent) exceeded the control limit. Arsenic was not detected in this sample. Therefore, the associated arsenic detection limit was qualified as an estimate (UJ).

The analytical spike percent recovery of selenium in samples B062D4 (62 percent), B062F6 (79 percent), B062V3 (77 percent), B062W9 (79 percent), and B062X5 (62 percent) exceeded the control limits. Selenium was not detected in these samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

In SDG number B062D3, the analytical spike percent recovery of selenium in samples B062D3 (68 percent), and B06317 (84 percent) exceeded the control limits. Selenium was not detected in these samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

After exceeding the analytical spike percent recovery limits for samples B062F5 and B062W8, the laboratory reanalyzed the selenium in samples by the method of standard additions (MSA), but the correlation coefficients were less than 0.995 (0.9681 and 0.9562, respectively). Selenium was not detected in these samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of thallium in samples B062D3 (53 percent), B062F5 (52 percent), B062P0 (46 percent), B062R5 (45 percent), B062V2 (53 percent), B062V6 (51 percent), B062W4 (53 percent), B062W8 (63 percent), B062X4 (55 percent), and B06317 (80 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

Case N205146. The analytical spike percent recovery of selenium in sample B062S3 (79 percent) exceeded the control limits. Selenium was not detected in this sample. Therefore, the associated selenium detection limit was qualified as an estimate (UJ).

The MSA correlation coefficient of selenium in samples B062B6 (0.9803), and B062P4 (0.9905) exceeded the MSA control limit. Selenium was detected in these samples. Therefore, the associated selenium data were qualified as estimates (J).

The analytical spike percent recovery of thallium in samples B062B6 (60 percent), B062P4 (43 percent), and B062S3 (45 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

Case N205023. For SDG number B062L1, the analytical spike percent recovery of thallium in samples B06309 (47 percent), B062L1 (49 percent), B062L4 (44 percent), B062N5 (47 percent), B062Q0 (47 percent), B062P7 (41 percent), B062Q3 (43 percent), B062Q6 (47 percent), and B062Z1 (63 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

For SDG number B062L0, the analytical spike percent recovery of selenium in samples B062P9 (77 percent), B062Q5 (51 percent), B06308 (52 percent), B062Q2 (67 percent), B062N4 (52 percent), B062Z0 (64 percent), and B062L3 (0 percent) exceeded the control limits. Selenium was not detected in these samples. Therefore, selenium results for sample B062L3 was qualified as rejected (R), and selenium results for the remaining samples were qualified as having estimated detection limits (UJ).

The analytical spike percent recovery of thallium in sample B062P9 (48 percent), B062P6 (49 percent), B062Q5 (58 percent), B06308 (53 percent), B062Q2 (43 percent), B062N4 (54 percent), B062Z0 (57 percent), and B062L3 (55 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore the associated thallium detection limits were qualified as estimates (UJ).

Case N205016. There were no GFAA quality control exceedences associated with this case.

Case N205055. For SDG number B062W1, the analytical spike percent recovery of arsenic in samples B062X1 (122 percent), B062X8(121 percent), B062Y7 (125 percent), and B062W1 (118 percent) exceeded the control limits. Arsenic was detected in these samples. Therefore, the associated arsenic data were qualified as estimates (J).

The analytical spike percent recovery of selenium in samples B062X1 (49 percent), B062X8 (40 percent), B062Y7 (52 percent), B062W1 (62 percent), B06311 (45 percent), and B062Y4 (77 percent) exceeded the control limits. Selenium was not detected in these samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of thallium in samples B062X1 (49 percent), B062X8 (45 percent), B062Y7 (50 percent), B062W1 (55 percent), and B062Y4 (65 percent) exceeded the control limits. The thallium data for these samples were qualified as rejected (R) due to matrix spike exceedences. No additional qualifiers were assigned.

For SDG number B062W2, the analytical spike percent recovery of arsenic in samples B06312 (66 percent), B062X2 (67 percent), B062X9 (71 percent), B062Y8 (67 percent), and B062W2 (62 percent) exceeded the control limits. Arsenic was detected in these samples. Therefore, the associated arsenic data were qualified as estimates (J).

The analytical spike percent recovery of selenium in samples B06312 (59 percent), B062X2 (82 percent), B062X9 (69 percent), B062Y8 (56 percent), B062W2 (61 percent), and B062Y5 (44 percent) exceeded the control limits. Selenium was not detected in these samples. Therefore, the associated selenium detection limits were qualified as estimates (UJ).

The analytical spike percent recovery of thallium in samples B06312 (56 percent), B062X2 (57 percent), B062X9 (44 percent), B062Y8 (52 percent), B062W2 (59 percent), and B062Y5 (58 percent) exceeded the control limits. Thallium was not detected in these samples. Therefore, the associated thallium detection limits were qualified as estimates (UJ).

4.3 ACCURACY

The overall accuracy goal for the 300-FF-5 metals of concern is ±25 percent. This goal was met for the target metals, except for mercury, thallium, and selenium.

4.3.1 Matrix Spike Exceedences for Mercury, Thallium, and Selenium

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must generally fall within the range of 75 to 125 percent.

The matrix spike results were acceptable with the following exceptions.

Case N204159. The matrix spike recovery was out of control for thallium in sample B062C7 (62 percent). Thallium was detected in the samples associated with this case. Therefore, the thallium concentrations were qualified as estimates (J).

Case N204110. The matrix spike recovery was out of control for mercury (55 percent), selenium (0 percent), and thallium (49 percent). Mercury, selenium, and thallium were not detected in the associated samples. Therefore, mercury and thallium data for all samples associated with this case were qualified as having estimated detection limits (UJ), and selenium data were qualified as rejected (R).

Case N205094. In SDG B062D4, the matrix spike recovery was out of control for mercury (72 percent), and thallium (53 percent). Mercury and thallium were not detected in the associated samples. Therefore, mercury and thallium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ).

In SDG B062D3, the matrix spike recovery was out of control for selenium (39 percent), and thallium (50 percent). Therefore, selenium and thallium data for all samples associated with this SDG were qualified as estimates (J) or as having estimated detection limits (UJ).

Case N205146. The matrix spike recovery was out of control for selenium (59 percent), and thallium (48 percent). Therefore, selenium and thallium data for all samples associated with this case were qualified as estimates (J) or as having estimated detection limits (UJ).

Case N205023. In SDG B062L1, the matrix spike recovery was out of control for thallium (51 percent). Thallium was not detected in the associated samples. Therefore, thallium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ).

In SDG B062L0, the matrix spike recovery was out of control for selenium (74 percent) and thallium (51 percent). Selenium data were not qualified as the percent recovery bordered the control limit. Thallium was not detected in the associated samples. Therefore, thallium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ).

Case N205016. The matrix spike recovery was out of control for selenium (47 percent) and thallium (44 percent). Selenium and thallium were not detected in the associated samples. Therefore, the selenium and thallium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ).

Case N205055. In SDG B062W1, the matrix spike recovery was out of control for selenium (46 percent) and thallium (17 percent). Selenium and thallium were not detected in the associated samples. Therefore, the selenium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ), and the thallium data was rejected (R).

In SDG B062W2, the matrix spike recovery was out of control for selenium (66 percent) and thallium (62 percent). Selenium and thallium were not detected in the associated samples. Therefore, the selenium and thallium data for all samples associated with this SDG were qualified as having estimated detection limits (UJ).

4.3.2 Laboratory Control Sample Results Acceptable

The laboratory control sample (LCS) monitors the overall performance of the analysis, including the sample preparation. An LCS should be digested and analyzed with every group of samples which have been prepared together. The performance criteria for aqueous LCS samples are 80 to 120 percent recovery.

One aqueous LCS was digested and analyzed with each case. The results were compared against the control windows and were found to be acceptable. Therefore no data were qualified based on the laboratory control samples.

4.4 PRECISION

Analytical duplicate sample analyses are used to measure laboratory precision and sample homogeneity. Field duplicate analyses are used to measure both the laboratory and the field sampling procedure precision.

Field split analyses are used to measure interlaboratory precision. The overall precision goal for the metals of concern is ± 20 percent.

4.4.1 Laboratory Duplicates Acceptable

The CLP RPD goal for analytical duplicates in an aqueous matrix is less than or equal to 25 percent.

One set of analytical duplicates were analyzed for all analytes with each SDG. The duplicate precision goals were met in all cases. Therefore, no qualifiers were assigned based on the analytical duplicate data.

4.4.2 Field Duplicates Acceptable

Four sets of field duplicate samples were analyzed for total metals (B06302 and B062C7 of Case A205003; B06305 and B062T2 of Case A205007; B06308 and B062P9 of Case A205017; and B06311 and B062X1 of Case A205032). In addition, four sets of field duplicate samples were analyzed for dissolved metals (B06303 and B062C8 of Case

A205003; B06306 and B062T3 of Case A205007; B06309 and B062Q0 of Case A205017; and B06312 and B062X2 of Case A205032).

Field duplicate precision was acceptable in all cases. Full presentation of field duplicate data and RPD calculations are given in Appendix A.

4.4.3 No Interlaboratory Precision Data

There were field split samples analyzed, but the Weston data have not yet been received for review. Therefore, interlaboratory precision could not be evaluated. No qualifiers were assigned because of this lack of interlaboratory precision data.

4.5 SAMPLE RESULT VERIFICATION

All of the sample results and reported detection limits for the samples selected by Westinghouse Hanford were recalculated to ensure that the reported results were accurate. Raw data were examined for anomalies, transcription errors, and reduction errors. In addition, the reviewer verified that the results fell within the linear range of the instrument.

Sample calculations were acceptable. No transcription errors or other anomalies were found.

4.6 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. The following changes were made after the submittal of the Preliminary QA Report:

- Lead concentrations for samples B062P4, B062S3, and B06321; zinc concentrations for sample B062V9); arsenic concentrations for samples B062K4, B062K5, and B062L9; and chromium concentrations for samples B062W4, B062X4, B06317, B062V6, B062V2, and B062D3 were qualified UJ due to negative blank values.

- Aluminum concentrations in sample B062S2; arsenic concentrations in samples B062B4 and B062P3; cadmium concentrations in sample B062S2; copper concentrations in samples B062B4 and B062P3; manganese concentrations in sample B062B4; nickel concentrations in samples B062S2 and B062P3; vanadium concentrations in sample B062P3; and selenium

concentrations in sample B062B4 were qualified as undetected (U) due to blank contamination.

- Lead concentrations in samples B062B4 and B062P3 were qualified as estimates (J) due to low analytical spike recovery.

4.7 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the nine metals cases discussed above, six additional Second Round Groundwater metals packages which were not validated were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 4-2. In no case were key deliverables noted to be missing

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062C7	*B062C8	B062N1	*B062N2	B06302	*B06303	*B062V9
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	21 U	21 U	24.5 U	21 U	21 U	21 U	46 U
Antimony	11 U	11 U	11 U	11 U	11 U	11 U	36 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	4 U
Chromium	43.6	5 U	5 U	5 U	54.8	5 U	7 U
Copper	10.5 U	9.1 U	4 U	4 U	10.5 U	9.1 U	7 U
Iron	287	73.6	163	86.7	354	87.3	58.3
Lead	1 U	1.5	1.1 J	1 U	1 U	1 U	NA
Manganese	6.1 U	4 U	125	122	6.8 U	3.8 U	2 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA
Nickel	26.7	5 U	5 U	5 U	29.3	6.8	18 U
Silver	3 U	3 U	3 U	3 U	3 U	3 U	8 U
Zinc	8 U	8 U	8 U	8 U	8 U	8 U	6 UJ
Additional Metals Reported:							
Arsenic	3.3 J	3 J	2 UJ	2 UJ	2.4	2.30 J	NA
Barium	38.2	38.2	38.2	38.2	40.6	38.2	42.2
Calcium	27700	29000	16800	16700	30300	28800	40200 J
Cobalt	2 U	2 U	2 U	2 U	2 U	2 U	7 U
Magnesium	5790	6040	5790	5780	6340	6000	7660 J
Potassium	3210	3370	4760	4770	3480	3160	3450
Selenium	4 UJ	6.9 J	20 UJ	4 UJ	4 UJ	4 UJ	NA
Sodium	12700	13400	43900	43600	14000	13200	16800 J
Thallium	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	NA
Vanadium	2 U	4.7 U	2 U	2 U	3.4 U	2 U	7.9 U

NA – not analyzed for
* – fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B062X6	*B062W6	*B062S4	*B062J0	B062K4	*B062K5	B062K7
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	46 U	46 U	46 U	30.3	585	679	722
Antimony	36 U	36 U	36 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	4 U	4 U	4 U	2 U	2 U	2 U	2 U
Chromium	7 U	7 U	7 U	3.2	81.1	3 U	20.2
Copper	7 U	7 U	7 U	2 U	5.5	2.8	3.8
Iron	507	110	444	23 U	1140	142 U	310
Lead	NA	NA	NA	1 U	1.6	1.3	3.5
Manganese	14.2	3.4	77.7	1.9	81.6	94.1	115
Mercury	NA	NA	NA	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Nickel	18 U	18 U	18 U	3 U	39.2	3 U	11.6
Silver	8 U	8 U	8 U	3 U	2 U	2 U	2.4 U
Zinc	6.9 J	9.3 J	6 U	11 U	52.8	17.2	17.1
Additional Metals Reported:							
Arsenic	NA	NA	NA	8.1 J	2 UJ	2 UJ	2 UJ
Barium	41.1	47.4	63	45.9	130	133	204
Calcium	42800 J	26700 J	19200	45700	18000	19400	24400
Cobalt	7 U	7 U	7 U	3 U	3 U	3 U	3 U
Magnesium	8280 J	5820 J	6900	12000	6690	6790	9290
Potassium	4850	3150	6460	4970	5350	5490	6520
Selenium	NA	NA	NA	4 R	20 R	20 R	20 R
Sodium	17000 J	10400 J	50300 J	16900	28000	28600	39900
Thallium	NA	NA	NA	1 UJ	1 UJ	1 UJ	1 UJ
Vanadium	10.7 U	6.2 U	5 U	15.6	2.2	2 U	2 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B062K8	B062L9	*B062M0	B062M2	*B062M3	B062H9	B062D4
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	35.2	22 U	394	460	192	1350	24 U
Antimony	16 U	16 U	16 U	16 U	16 U	16 U	11 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U	2 U	2 U	2 U	1 U
Chromium	3 U	23.9	3 U	270	3 U	88.4	5 U
Copper	2 U	2 U	2.8	14.7	2 U	9.8	4 U
Iron	141 U	253 U	168 U	2070	267	2500	25 U
Lead	1.5 J	1.5 J	2	2.6	2	1.3	1.3 J
Manganese	58.8	87	109	104	79.1	59.7	2 U
Mercury	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Nickel	3 U	9.4	3 U	144	3 U	42.1	5 U
Silver	2.4 U	2 U	5 U	2 U	3.4 U	2 U	3 U
Zinc	11 U	11 U	12.8	42.2	13.6	808	13.1 U
Additional Metals Reported:							
Arsenic	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	8.5 J	4.9
Barium	206	153	157	93.2	95.8	59.6	27.8
Calcium	21900	17800	18900	20800	20800	46500	30600
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	2 U
Magnesium	8930	6400	6520	7480	7520	12400	6270
Potassium	6430	5460	5480	6030	6150	5080	3550
Selenium	20 R	20 R	20 R	20 R	20 R	20 R	4 UJ
Sodium	38600	33300	33500	42100	43300	17100	11800
Thallium	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	5 UJ	2 UJ
Vanadium	2 U	2 U	2 U	5.1	2 U	19.3	7.2 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062F6	B062P1	B062R6	E062V3	*B062V7	*B062W5	B062W9
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	23.1 U	22.6 U	26.6 U	22.2 U	21 U	29.4 U	34.3 U
Antimony	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1.3 U	1 U	1 U	1 U	1 U	1 U
Chromium	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	4 U	4 U	4 U	4 U	4 U	4 U	4.8
Iron	25 U	53 U	25 U	25 U	25 U	127 U	269 U
Lead	1 U	1.4 J	1 U	1.9	1.3 J	1 U	1.8 J
Manganese	3.2 U	2.2 U	51.1	1.2 U	1.8 U	3 U	13.4 U
Mercury	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ	0.2 UJ
Nickel	5 U	5 U	5 U	5 U	5 U	5 U	10.1
Silver	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Zinc	38.2 U	18.3 U	8 U	16.2 U	14.8 U	19 U	8 U
Additional Metals Reported:							
Arsenic	2.6	3.5 J	2 UJ	2.5	2.3 J	2 U	2 U
Barium	52.5	53.5	59.5	42.6	41.6	49.6	46.6
Calcium	36000	43500	13000	23800	36800	24500	28400
Cobalt	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Magnesium	6860	9040	4950	4840	7000	5320	6220
Potassium	3830	3220	6450	2930	3210	3090	3180
Selenium	20 UJ	4.8	20 U	4 UJ	4 U	4 U	4 UJ
Sodium	13400	16700	57000	10400	15500	9920	10300
Thallium	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	4.1 U	2 U	2 U	2 U	2 U	2 U	2 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	♦B062X5	B06318	B062D3	B062F5	B062P0	♦B062R5	♦B062V2
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	30.8 U	21 U	22 U	22 U	31.2	32.2	41.1
Antimony	11 U	11 U	16 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	2 U	2 U	2 U	2 U	2 U
Chromium	5 U	5 U	3 UJ	3.5 J	82.7	19.7	3 UJ
Copper	4 U	4 U	2 U	3.3	3	2 U	4
Iron	25 U	25 U	72.6 J	39.5 J	392 J	201 J	103 J
Lead	1 U	1.5	2.7	1.1	1 U	1.2	1.8
Manganese	2.8 U	1 U	1 U	1 U	7.6	55.5	1 U
Mercury	0.2 UJ	0.2 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	5 U	5 U	9.2	3.6	99.6	205	3 U
Silver	3 U	3 U	2 U	2 U	2 U	2 U	2 U
Zinc	10.1 U	15.7 U	11 U	11 U	11 U	11 U	13.8
Additional Metals Reported:							
Arsenic	3.2	2 U	4.1	2 U	4.8	2 U	2.7
Barium	38.6	5 U	28.2 J	52.6 J	55.8 J	64.6 J	47.2 J
Calcium	38200	74.9 U	32500	37800	45300	13400	25600
Cobalt	2 U	2 U	3 U	3 U	3 U	3 U	3 U
Magnesium	7450	55 U	6570	7150	9370	5100	5160
Potassium	4370	194 U	3770	4100	3210	6910	3070
Selenium	4 UJ	4 U	4 UJ	4 UJ	10.1 J	20 UJ	6 J
Sodium	15900	122 U	12900	14200	17600	60900	11300
Thallium	2 UJ	2 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Vanadium	3.6 U	2 U	7 U	5 U	3.8 U	2 U	3.1 U

NA – not analyzed for
♦ – fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B062V6	*B062W4	B062W8	*B062X4	B06317	*B062B6	*B062P4
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	22 U	22 U	22 U	34.7	22 U	22 U	22 U
Antimony	16 U	16 U	16 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chromium	3 UJ	3 UJ	20.6	3 UJ	3 UJ	5	4.6
Copper	2 U	3	6.2	2	2 U	2.9 U	2 U
Iron	51.4 J	182 J	2970 J	2010 J	23 U	23 U	85.6
Lead	1.4	1.2	1 U	1.1	2.6	1 J	1 UJ
Manganese	1 U	2.6	22.2	26.5	1 U	1.3 U	2.6 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	3 U	3 U	16.8	7.6	3 U	3 U	5.6 U
Silver	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Zinc	11 U	14.3	11 U	19	11.7	11 U	11 U
Additional Metals Reported:							
Arsenic	2 U	2 U	2 U	2.2	2 U	2 U	2 U
Barium	46.8 J	52.8 J	52.6 J	46.8 J	1 U	38.9	37.2
Calcium	39200	26200	30000	41700	158	47100	47700
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Magnesium	7410	5650	6470	7960	22 U	9560	10300
Potassium	3280	3230	3160	4480	82 U	2510	2240
Selenium	4 UJ	4 UJ	4 UJ	4 UJ	4 UJ	6.4 J	9.7 J
Sodium	16800	10600	10800	16800	67 U	17000	20300
Thallium	1 UJ	1 UJ	1 UJ	1 UJ	1.1 J	2 UJ	2 UJ
Vanadium	3.9 U	2 U	2.5 U	7 U	2 U	3.5 U	4.3 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B062S3	*B06321	*B062B4	B062P3	*B062S2	B06320	B062L0
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	22 U	22 U	22 U	22 U	26.2 U	22 U	21 U
Antimony	16 U	16 U	16 U	16 U	16 U	16 U	11 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U	2 U	2.1 U	2 U	1 U
Chromium	3 U	3 U	3 U	15	8.4	3 U	15.9
Copper	2 U	2.2 U	2.6 U	2.2 U	2 U	2 U	4 U
Iron	361	23 U	51.3	206	467	23 U	77.6 U
Lead	1 UJ	1 UJ	2.9 J	3.2 J	3.5	2.8	1 UJ
Manganese	74.9	1.3 U	1.5 U	5.9	80.6	1 U	11.5 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	3 U	3 U	3 U	12.3 U	8.5 U	3 U	5.4
Silver	2 U	2 U	2 U	2 U	2 U	2 U	3 U
Zinc	11 U	11 U	13.6	11 U	11 U	11 U	8 U
Additional Metals Reported:							
Arsenic	2 U	2 U	4.9 U	2.3 U	1 U	1 U	4.2 U
Barium	62.7	1 U	39.5	38.7	65.2	1 U	45.2
Calcium	18000	34 U	48800 J	48800 J	18900 J	34 U	45200
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	2 U
Magnesium	6360	22 U	9860	10500	6680	22 U	9100
Potassium	5780	82 U	2590	2320	6030	82 U	4470
Selenium	20 UJ	4 UJ	4.7 U	4 UJ	4 R	4 UJ	4 UJ
Sodium	47100	67 U	17500	20700	48400	67 U	17500
Thallium	2 UJ	2 UJ	20 UJ	23.4 J	4 UJ	4 UJ	2 UJ
Vanadium	2 U	2 U	2 U	4.7 U	2 U	2 U	3.7 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062L3	B062N4	B062P6	*B062P9	B062Q2	B062Q5	B062Z0
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	260	201	35.2 U	21 U	31.9 U	26.8 U	21 U
Antimony	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1.2 U	1 U	1 U	1 U
Chromium	17.1	71.9	15.3	5 U	69.5	8.2	5 U
Copper	4.8 U	7.7 U	4 U	4 U	4 U	4 U	4 U
Iron	631	1240	116 U	38.8 U	515	106 U	84.4 U
Lead	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Manganese	159	216	7.4 U	5 U	13.4 U	5.7 U	6 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	9.1	40	51.5	8.8	48.1	27.8	5 U
Silver	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Zinc	8 U	28.3	8 U	8 U	8 U	8 U	50.8
Additional Metals Reported:							
Arsenic	2 U	2 U	2 U	6.8 U	5.6 U	7.9 U	3.2 U
Barium	47.5	64.5	41.8	41.8	40.7	45.2	57.7
Calcium	15600	14800	50300	47100	45800	44200	66800
Cobalt	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Magnesium	4940	5650	10900	9790	9500	11600	12400
Potassium	4610	5950	2860	4530	3950	5930	5940
Selenium	20 R	20 UJ	4 UJ	4 UJ	4 UJ	4 UJ	20 UJ
Sodium	38300	49900	19400	22600	20700	21800	11300
Thallium	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	2 U	3 U	5.3 U	10.6 U	8.7 U	12.2 U	7.9 U

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B06308	B062L1	B062L4	B062N5	B062P7	*B062Q0	B062Q3
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	21 U	21 U	32.2 U	33.1 U	21 U	21 U	21.5 U
Antimony	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	9.4	5 U	5 U	5 U	5 U	5.3	5 U
Copper	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Iron	38.8 U	35.1 U	116 U	560	38.8	25 U	38.8 U
Lead	1 UJ	2 U	3.9 U	1.5 U	3.3	3 U	2.5 U
Manganese	1 U	4.5 U	152	215	5.2	4.1 U	5.2
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	9.5	5 U	5 U	5 U	41.3	5 U	5 U
Silver	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Zinc	8 U	8 U	8 U	8 U	8 U	8 U	8 U
Additional Metals Reported:							
Arsenic	5.2 UJ	3.6 UJ	2 UJ	2 UJ	2.4 UJ	6 UJ	5.2 UJ
Barium	44.1	47.5	47.5	65.6	37.3	43	38.5
Calcium	45900	49200	16600	15700	46200	47800	47700
Cobalt	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Magnesium	9540	9910	5270	5940	9980	9920	9790
Potassium	4400	4950	4930	6190	2600	4580	4100
Selenium	4 UJ	7.2 J	20 UJ	20 UJ	4 UJ	4 UJ	9.2 J
Sodium	22000	19000	41200	53400	18000	23100	21700
Thallium	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ	2 UJ
Vanadium	11.1 U	4.2 U	2 U	2 U	3.7	9.5 U	8.4

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062Q6	B062Z1	*B06309	*B062S9	B062T0	*B062T2	*B062T3
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	21 U	21 U	21 U	29 U	22 U	26.5 U	30.7 U
Antimony	11 U	11 U	11 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1.2 U	2 U	2 U	2 U	2 U
Chromium	5 U	5 U	5 U	24.3	3 U	20	3 U
Copper	4 U	4 U	4 U	2 U	2 U	2 U	2 U
Iron	31.1 U	38.8 U	29.1 U	144	39	314	180
Lead	1.3 U	2.4 U	1.2 U	2 U	2 U	2 U	2 U
Manganese	5 U	5.2 U	5.2 U	2.2 U	1 U	40.1	40.3
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	6.4	5 U	5 U	16.4 U	3 U	11.7 U	3 U
Silver	3 U	3 U	3 U	2 U	2 U	2 U	2 U
Zinc	8 U	43.2	12.7	15.2	11 U	11 U	11 U
Additional Metals Reported:							
Arsenic	6.8 UJ	3 UJ	9.6 UJ	7.9	7	2 U	2 U
Barium	43	57.7	44.1	46.7	45.3	38.4	39.2
Calcium	44500	66600	47300	45400	44100	12300	12600
Cobalt	2 U	2 U	2 U	3 U	3 U	3 U	3 U
Magnesium	11700	12400	9840	12600	12300	5050	5150
Potassium	5950	5870	4520	6310	6220	6160	6300
Selenium	4 UJ	4 UJ	20 UJ	4 J	4 UJ	20 UJ	20 UJ
Sodium	22200	11300	22600	22400	21900	61500	62900
Thallium	2 UJ	2 UJ	2 UJ	4 UJ	4 UJ	4 UJ	4 UJ
Vanadium	12.1 U	7.9 U	10 U	11.3	10.1	2	2

NA - not analyzed for
* - fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	*B062T5	B062T6	*B06305	*B06306	B062W1	*B062X1	B062X8
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:							
Aluminum	22 U	22 U	25.4 U	22 U	22 U	22 U	55.4
Antimony	16 U	16 U	16 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Chromium	3 U	3 U	43.4	3 U	3 U	3 U	363
Copper	2 U	2 U	2 U	2 U	2 U	2 U	4.7 U
Iron	286	250	420	185	63.9	55.2	1830
Lead	2 U	2 U	2 U	2 U	1.8	2.5	1.4
Manganese	58.3	59.1	44.4	40.5	1.7	1 U	38.1
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	6.2 U	3 U	23.4	3.5 U	3 U	3 U	187
Silver	2 U	2 U	2 U	2 U	2 U	2.3	2 U
Zinc	31	11 U	11 U	11 U	22	47.9	11 U
Additional Metals Reported:							
Arsenic	2 U	2 U	2 U	2 U	4.1 J	4.2 J	4.6 J
Barium	64.2	64.3	40.8	40.1	37.8	34.2	34.2
Calcium	12700	12800	12700	12700	41200	37600	37000
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Magnesium	5090	5130	5230	5280	8620	7400	7470
Potassium	6460	6480	6390	6420	4710	4510	4440
Selenium	20 UJ	20 UJ	20 UJ	20 UJ	4 UJ	4 UJ	4 UJ
Sodium	62900	63300	64000	64600	18300	16400	16200
Thallium	4 UJ	4 UJ	4 UJ	4 UJ	1 R	1 R	1 R
Vanadium	2	2	2	2	6.4	7.5	8.6

NA – not analyzed for
* – fully validated sample

Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062Y4	B062Y7	*B06311	B062W2	*B062X2	B062X9
Units:	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:						
Aluminum	22.6	22 U	22 U	22 U	22 U	22 U
Antimony	16 U	16 U	16 U	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U	2 U	2 U	2 U
Chromium	11.9	19.3	3 U	3 U	3 U	3.4
Copper	3.2 U	2 U	2.4 U	2 U	2 U	2 U
Iron	9310	450	127	272	52.4	116
Lead	1.6	1.6	1.4	2 U	2 U	4.3
Manganese	23.9	3.6	1.5	1.5	2.1	1.5
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	5.7	7.7	3 U	3 U	3 U	3 U
Silver	2 U	2 U	2 U	2 U	2 U	2 U
Zinc	11 U	11 U	62.4	11 U	11 U	11 U
Additional Metals Reported:						
Arsenic	6.7	4.6 J	6.9	3.9 J	4.9 J	4.2 J
Barium	41.2	48	34.9	37.5	32.7	34
Calcium	40200	38900	38000	40600	37200	37600
Cobalt	3 U	3 U	3 U	3 U	3 U	3 U
Magnesium	8170	8240	7500	8460	7340	7600
Potassium	5040	5410	4610	4530	4580	4530
Selenium	20 UJ	4 UJ	4 UJ	20 UJ	20 UJ	20 UJ
Sodium	16900	20100	16800	17900	17100	16600
Thallium	1 R	1 R	5 R	4 UJ	4 UJ	4 UJ
Vanadium	12.4	9.4	8.6	7.1	6.4	7.5

NA - not analyzed for
* - fully validated sample

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Table 4-1 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Analysis and Qualifier Summary

Sample No.:	B062Y5	B062Y8	*B06312
Units:	µg/L	µg/L	µg/L
300-FF-5 Metals of Concern:			
Aluminum	22 U	22 U	22 U
Antimony	16 U	16 U	16 U
Beryllium	1 U	1 U	1 U
Cadmium	2 U	2 U	2 U
Chromium	3 U	5	3.4
Copper	2 U	2 U	2 U
Iron	81.9	226	85.1
Lead	2.3	2 U	4.1
Manganese	1.3	1.9	2.9
Mercury	0.2 U	0.2 U	0.2 U
Nickel	3 U	3 U	3 U
Silver	2 U	2 U	2 U
Zinc	11 U	11 U	11 U
Additional Metals Reported:			
Arsenic	13.9	5 J	5.5 J
Barium	37.7	46.9	33.2
Calcium	38500	38700	38000
Cobalt	3 U	3 U	3 U
Magnesium	7830	8190	7500
Potassium	4800	5340	4680
Selenium	20 UJ	20 UJ	20 UJ
Sodium	16200	19900	17400
Thallium	4 UJ	4 UJ	4 UJ
Vanadium	10.1	11.2	7.5

NA – not analyzed for
* – fully validated sample

Table 4-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Data Package Completeness Verification Results

Data Package Item	Case Number						
	N2-04-063	N1-04-117	N2-05-076	N2-04-150	N2-06-086	N2-04-130	N2-04-140
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Data							
Inorganic Analysis Data Sheets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data							
Initial and Cont. Calibration Verfication	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CRDL Standard for AA and ICP	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary							
Blanks	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interference Check Summary	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Spike Sample Recovery	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Post-Digestion Sample Recovery	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Duplicate	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standard Addition Results	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Serial Dilution	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrument Detction Limits	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Interelement Correction Factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ICP Linear Ranges	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Preparation Log	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Analysis Log Run	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Raw Data							
ICP Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Furnace AA Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mercury Raw Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cyanide Raw Data	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Data							
Internal Laboratory Chain-of-Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Sample Preparation Records	Yes	Yes	Yes	Yes	Yes	Yes	Yes
%Solids Analysis Records	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No	No	No	No

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5.0 CONVENTIONAL WET CHEMISTRY DATA VALIDATION AND LIMITATIONS

5.1 SUMMARY

5.1.1 Twelve Sample Delivery Groups

Sample results from the following twelve general chemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Fully Validated
TMA	A205050	10	0
TMA	A205003	3	2
TMA	A204064	5	4
TMA	A205072	4	0
TMA	A205017	8	2
TMA	A205007	4	4
TMA	A205032	6	2
TMA	A205025	1	1
Weston	9205L175	3	3
Weston	9204L083	4	4
Weston	9205L332	2	0
Weston	9205L406	1	0

Data qualifiers assigned to the 300-FF-5 analytes of concern (pH, ammonium, fluoride, nitrate, and nitrite) and for all other analytes reported as detected for these cases are summarized in Tables 5-1 and 5-2.

5.1.2 All Samples Validated

Results for all the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. All of the reported results for quality assurance samples associated with these cases were reviewed. For Case A205007 one hundred percent of the quality assurance sample results were recalculated, and quality control

calculations verified. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

5.1.3 Westinghouse Hanford Validation Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedures for Chemical Analyses (WHC 1992a). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990).

5.1.4 Samples Analyzed According to Non-CLP Protocols

— A total of fifty-one aqueous samples were submitted for analysis for general chemistry analytes.

Forty-one samples were submitted for analysis for fluoride, nitrite, nitrate, pH, and ammonia. Of these forty-one samples, fourteen were also analyzed for chemical oxygen demand (COD), total dissolved solids (TDS), total suspended solids (TSS), alkalinity, hardness, chloride, sulfate and phosphate.

Ten samples were submitted for analysis for total organic carbon (TOC) and total organic halides (TOX).

Samples were analyzed by EPA Standard methods for wastewater analysis.

5.1.5 Majority of Data Quality Objectives Met

The analyses were complete and CRDL requirements were met. Many of the results were qualified as estimates due to quality control exceedences. However, overall, the data quality objectives were met.

5.1.6 Minor Deficiencies in Other Qualified Data

There were numerous minor deficiencies associated with the analysis of these samples. These included the following: holding time exceedences; insufficient ICV or LCS analyses performed; lack of daily calibrations in some instances; and blanks were not analyzed in some instances.

These deficiencies and the resulting data qualifications are explained in greater detail below.

5.2 ANALYTICAL METHODS

Performance of specific instrumental quality assurance and quality control procedures, including deficiencies noted during the quality assurance review, are outlined below.

5.2.1 Instrument Calibration and Verification Criteria

5.2.1.1 Anions by Ion Chromatography (IC)

The IC used for the analysis of anions (fluoride, nitrite, nitrate, and sulfate) must be calibrated on each day of use, using a minimum of three standards and a calibration blank. The correlation coefficient of a least squares linear regression must be equal to or greater than 0.995.

5.2.1.2 Ammonia by Ion Selective Electrode (ISE)

The ISE used for the analysis of ammonia (as nitrogen, N) must be calibrated on each day of use, using a minimum of three standards. No calibration blank is required (although a method blank is required). Using semilogarithmic paper the concentration of ammonia (as N) versus the electrode potential is plotted, and a line of best fit is drawn.

5.2.1.3 Electrometric pH

The pH meter used for the analysis of pH must be calibrated daily according to the manufacturers instructions, using a minimum of two reference buffers that bound the range of the sample analyses.

5.2.1.4 TOC/TOX Calibration

The instruments used to measure TOC and TOX must be calibrated each day of use, using a minimum of one standard. No calibration blank or method blank are required.

5.2.1.5 Calibration Verification

The above calibrations are each immediately verified with an ICV standard analysis. The ICV standard is prepared from a source independent of the calibration standards, at a mid-calibration range concentration. The ICV percent recovery must fall within the control limits of 90 to 110 percent for anions by IC and fluoride by ISE, 80 to 120 percent for TOC/TOX, and $\pm$0.2 for pH.

The calibrations are subsequently verified at regular intervals using a CCV standard. The control limits for percent recovery of CCV standards are the same as the ICV control limits.

5.2.2 Laboratory Performance Against Criteria

Case A205050. There was no calibration verification performed for ammonia or anions in this case. Therefore, all ammonia and anion sample data (B062P0, B062R5, B062V2, B062V6, B06317, B062D3, B062F5, B062W4, B062W8, and B062X4) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205003. There was no calibration verification performed for ammonia or anions in this case. Therefore, all ammonia and anion sample data (B062C7, B062N1, and B06302) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A204064. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for ammonia, and no calibration verification performed for anions in this case. Therefore, all ammonia and anion sample data (B062L9, B062N9, B062K4, B062K7, and B062N2) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205072. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for anions or ammonia in this case. Therefore, all ammonia and anion sample data (B062B4, B062P3, B062S2, and B06320) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205017. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for ammonia, and no calibration verification performed for anions in this case. Therefore, all ammonia and anion sample data (B062L0, B06308, B062L3, B062N4, B062P9, B062P6, B062Q2 and B062Q5) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205007. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for anions in this case. Therefore, all anion sample data (B062S9, B062T2, B062T5, and B06305) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205032. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for anions and ammonia in this case. Therefore, all anion and ammonia sample data (B06311, B062X1, B062X8, B062Y7, B062W1 and B062Y4) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case A205025. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for ammonia, and no calibration verification performed for anions in this case. Therefore, all ammonia and anion sample data (B062Z0) were qualified as estimates (J), or as having estimated detection limits (UJ).

Case 9205L175. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for TOX in this case. Therefore, all TOX sample data (B062C9, B062N2, and B06304) were qualified as estimates (J or UJ).

Case 9204L083. There was no initial calibration performed on the day of analysis for TOX in this case. Therefore, all TOX sample data (B062F4, B062G3, B062G6 and B062M7) were qualified as estimates (J or UJ).

Case 9205L332. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for TOX in this case. Therefore, all TOX sample data (B062D5 and B062F7) were qualified as estimates (J or UJ).

Case 9205L406. The lab performed an initial calibration; however, there was no initial calibration performed on the day of analysis (WHC 1992a) for TOX in this case. Therefore, TOX sample data (B062B7) were qualified as an estimate (J).

5.2.3 Acceptable Blank Analyses

Blanks were analyzed for all of the IC analytes and were found to be acceptable, with no detectable contamination. In Cases A205050, A205003, A205007, and A205032 there were no method blanks analyzed for ammonia with the samples. The data were not qualified due to this deficiency, as there was a calibration blank analyzed which was acceptable.

5.3 HOLDING TIMES EXCEEDED FOR ANIONS, pH, AMMONIA, AND TOX

Analytical holding times for fluoride, nitrite, nitrate, sulfate, pH, ammonia, COD, TDS, TSS, alkalinity, hardness, chloride, and phosphate analyses were assessed to ascertain whether the holding time requirements were met by the laboratory. The holding time requirements are as follows: samples must be analyzed within 72 hours (3 days) for pH; within 48 hours for phosphate; within 7 days for TOX, TDS, and TSS; and within 28 days for all other analytes.

Case A205050. The holding times were exceeded for pH analysis for all samples associated with this case (B062P0, B062R5, B062V2, B062V6, B06317, B062D3, B062F5, B062W4, B062W8, and B062X4). The pH data for these samples were qualified as estimates (J).

Case A205003. The holding times were exceeded for pH, COD, TSS, and TDS for samples B062C7, B062N1, and B06302. The pH, COD, TSS, and TDS data for these samples were qualified as estimates (J).

Case A204064. The holding times were exceeded for pH for all samples associated with this case (B062L9, B062N9, B062K4, B062K7, and B062N2). The pH data for these samples were qualified as estimates (J).

Case A205072. The holding times were exceeded for pH for all samples associated with this case (B062B4, B062P3, B062S2, and B06320). The pH data for these samples were qualified as estimates (J).

Case A205017. The holding times were exceeded for COD, and ammonia for samples B062L0, B062L3, and B062N4. The COD and ammonia data for these samples were qualified as estimates (J).

Case A205007. The holding times were exceeded for pH for all samples associated with this case (B062S9, B062T2, B062T5, and B06305). The pH data for these samples were qualified as estimates (J).

Case A205032. The holding times were exceeded for pH for all samples associated with this case (B06311, B062X1, B062X8, B062Y7, B062W1, and B062Y4). The pH data for these samples were qualified as estimates (J).

Case A205025. The holding times were exceeded for ammonia for all samples associated with this case (B062Z0). The ammonia data for this sample were qualified as an estimate (J).

Case 9205L175. All holding times were met for the analyses associated with this case.

Case 9204L083. All holding times were met for the analyses associated with this case.

Case 9205L332. All holding times were met for the analyses associated with this case.

Case 9205L406. The holding times were exceeded for TOX for sample B062B7. The TOX data for this sample were qualified as an estimate (J).

5.4 ACCURACY

The overall accuracy goals for the analytes of concern are ± 10 percent for fluoride, nitrate, and nitrite; and ± 25 percent for ammonia.

5.4.1 Acceptable Matrix Spike Analyses

Matrix spike analyses are used to assess the analytical accuracy of the reported data and the effect of the matrix on the ability to accurately quantify sample concentrations. Matrix spike recoveries must generally fall within the range of 75 to 125 percent.

Matrix spike analyses for these cases met the percent recovery criteria for IC anions. The ISE ammonia matrix spike met the percent recovery criteria. No matrix spike analyses were performed for the other analytes and were not required. No qualifiers were assigned based on the matrix spike data.

5.4.2 Laboratory Control Sample

The LCS monitors the overall performance of the analysis, including the sample preparation. An LCS should be prepared (e.g., digested) and analyzed with every group of samples which have been prepared together. The performance criteria for aqueous LCS percent recovery is 80 to 120 percent.

Aqueous LCS (blank spikes) analyzed for the analytes in these cases were found to be acceptable.

5.5 PRECISION

The overall precision goals for the analytes of concern are ± 10 percent for fluoride, nitrate, and nitrite; and ± 20 percent for ammonia.

5.5.1 Acceptable Duplicate Analyses

5.5.1.1 Acceptable Analytical Duplicates

Analytical (laboratory) duplicate sample analyses are used to measure laboratory precision and sample homogeneity.

Twelve sets of analytical duplicate results were submitted with these cases. The analytical duplicates met the RPD criteria of less than 25 percent. Therefore, no qualifiers were assigned based on the duplicate data.

5.5.1.2 Field Duplicates Acceptable

Field duplicate analyses are used to measure precision of both the laboratory and the field sampling procedure.

There were four sets of field duplicate samples analyzed for general chemistry analytes (B06302 and B062C7 of Case A205003; B06305 and B062T2 of Case A205007; B06308 and B062P9 of Case A205017; and B06311 and B062X1 of Case A205032).

The field duplicate precision was acceptable in all cases.

Full presentation of field duplicate data and RPD calculations are given in Appendix A.

5.5.1.3 No Field Split Samples

Field split analyses are used to measure interlaboratory precision.

There were field split samples analyzed, but the Weston data have not yet been received for review. Therefore, interlaboratory precision could not be evaluated. No qualifiers were assigned because of this lack of interlaboratory precision data.

5.6 SAMPLE RESULT VERIFICATION

Sample results and reported detection limits were recalculated to ensure that the reported results were accurate. Raw data were examined for anomalies, transcription errors, and reduction errors. In addition, the reviewer verified that the results fell within the linear range of the instrument. There were no discrepancies found. The data are acceptable for use as qualified.

5.7 CHANGES MADE SINCE PRELIMINARY REPORT

Data qualifier assignments and documentation were reviewed by a senior validator and a technical reviewer. The following changes were made after the submittal of the Preliminary QA Report:

- TSS and TDS data for samples in Case A205050 (B062P0, B062R5, B062V2, B062V6, B06317, B062D3, B062F5, B062W4, B062W8, and B062X4) and in Case A205017 (B062L0, B062L3, and B062N4) were unqualified. The data had been qualified as estimates (J) due to a lack of standard reference materials. During review it was determined that as all method procedures were followed the data were acceptable without qualification.

- COD, hardness, alkalinity, TSS, and TDS data for samples in Case A204064 (B062L9, B062N9, B052K4, B062K7, and B062N2) were unqualified. The data had been qualified as estimates (J) due to a lack of blank analyses. During review it was determined that the blank data, while useful, is not meaningful in the accurate quantitation of these analytes in these samples.

  No other changes were made to the sample data.

- COD, hardness, alkalinity, TSS, and TDS data for samples in Case A205072 (B062B4, B062P3, B062S2, and B06320) were unqualified. The data had been qualified as estimates (J) due to lack of calibration data. During review it was determined that these methods require no calibration of instrumentation. Appropriate quality control analyses had been performed, and the data are acceptable.

5.8 UNVALIDATED DATA PACKAGES COMPLETE

In addition to validating analytical results for the twelve general chemistry cases discussed above, thirteen additional Second Round Groundwater general chemistry packages, which were not validated, were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 5-3. In no case were key deliverables noted to be missing

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	B062P0	B062R5	B062V2	B062V6	B06317	B062D3	B062F5	B062W4
Analytes of Concern:								
Ammonia in mg/L	0.05 UJ	0.12 J	0.06 J	0.05 UJ	0.05 J	0.05 UJ	0.05 UJ	0.05 UJ
Fluoride in mg/L	0.3 J	1.5 J	0.4 J	0.3 J	0.1 UJ	0.3 J	0.4 J	0.4 J
Nitrate in mg/L	4.6 J	0.2 UJ	2.2 J	3.3 J	0.2 UJ	1.8 J	3.7 J	3.8 J
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ
pH	7.4 J	8.2 J	7.1 J	7.4 J	5.8 J	7.9 J	7.4 J	7.1 J
Additional Analytes:								
COD in mg/L	NA	NA	NA	NA	NA	30 U	30 U	NA
TDS in mg/L	NA	NA	NA	NA	NA	176 J	190 J	NA
TSS in mg/L	NA	NA	NA	NA	NA	5 U	5 U	NA
Alkalinity in mg/L	NA	NA	NA	NA	NA	98 J	86	NA
Hardness in mg/L	NA	NA	NA	NA	NA	111	129	NA
Chloride in mg/L	NA	NA	NA	NA	NA	8.9 J	20.2 J	NA
Sulfate in mg/L	NA	NA	NA	NA	NA	23 J	30 J	NA
Phosphate in mg/L	NA	NA	NA	NA	NA	0.4 UJ	0.4 UJ	NA

NA - not analyzed for
♦ - fully validated sample

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	B062W8	B062X4	*B062C7	*B062N1	B06302	*B062L9	B062H9	*B062K4
Analytes of Concern:								
Ammonia in mg/L	0.05 UJ	0.09 J	0.05 UJ	0.05 UJ	0.09 J	0.14 J	0.05 UJ	0.07 J
Fluoride in mg/L	0.4 J	0.4 J	0.3 J	0.8 J	0.5 J	0.6 J	0.3 J	0.5 J
Nitrate in mg/L	3.3 J	3.4 J	4.1 J	0.2 UJ	4.2 J	0.2 UJ	5.3 J	0.2 UJ
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	NA	NA	NA	NA	NA	NA
pH	7.4 J	7.7 J	6.8 J	8.2 J	7.1 J	8.1 J	8 J	8 J
Additional Analytes:								
COD in mg/L	NA	NA	30 UJ	30 UJ	30 UJ	30 U	30 U	30 U
TDS in mg/L	NA	NA	158 J	191 J	161 J	205	290	210
TSS in mg/L	NA	NA	8 J	5 UJ	5 UJ	5 U	55	12
Alkalinity in mg/L	NA	NA	73	157	74	146	143	134
Hardness in mg/L	NA	NA	95	67	97	77	178	77
Chloride in mg/L	NA	NA	20.9 J	6.4 J	19.4 J	5.4 J	13.6 J	4.8 J
Sulfate in mg/L	NA	NA	20 J	1 UJ	21 J	4 J	36 J	8 J
Phosphate in mg/L	NA	NA	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ	0.4 UJ

NA - not analyzed for
* - fully validated sample

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	*B062K7	*B062N2	*B062B4	B062P3	*B062S2	B06320	B062L0
Analytes of Concern:							
Ammonia in mg/L	0.1 J	0.14 J	0.05 UJ	0.05 UJ	0.08 J	0.09 J	0.07 J
Fluoride in mg/L	0.5 J	1.2 J	0.2 J	0.30 J	0.9 J	0.1 UJ	0.3 J
Nitrate in mg/L	0.2 UJ	0.2 UJ	4.8 J	5 J	0.2 UJ	0.2 UJ	3.9 J
Nitrite (as NO3-) in mg/L	NA	NA	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	NA
pH	8.1 J	8.2 J	7.5 J	7.6 J	8.2 J	6.1 J	7.5
Additional Analytes:							
COD in mg/L	30 U	30 U	30 U	NA	NA	NA	30 UJ
TDS in mg/L	249	247	276	NA	NA	NA	260
TSS in mg/L	5 U	24	6	NA	NA	NA	5 U
Alkalinity in mg/L	178	175	111	NA	NA	NA	121
Hardness in mg/L	100	87	160	NA	NA	NA	163
Chloride in mg/L	9.7 J	9 J	18.5 J	NA	NA	NA	20.2 J
Sulfate in mg/L	1 UJ	1 UJ	51 J	NA	NA	NA	46 J
Phosphate in mg/L	0.4 UJ	0.4 UJ	0.4 UJ	NA	NA	NA	0.4 UJ

NA - not analyzed for
* - fully validated sample

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	*B06308	B062L3	B062N4	*B062P9	B062P6	B062Q2	B062Q5
Analytes of Concern:							
Ammonia in mg/L	0.06 J	0.1 J	0.1 J	0.07 J	0.07 J	0.09 J	0.06 J
Fluoride in mg/L	0.4 J	0.8 J	1.1 J	0.4 J	0.2 J	0.4 J	0.4 J
Nitrate in mg/L	4.3 J	0.2 UJ	0.2 UJ	4.3 J	4.3 J	4.6 J	4.8 J
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	NA	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ
pH	7.8	8.2	8.1	8.2	8 J	7.8	8
Additional Analytes:							
COD in mg/L	NA	30 UJ	30 UJ	NA	NA	NA	NA
TDS in mg/L	NA	172	211	NA	NA	NA	NA
TSS in mg/L	NA	5 U	5 U	NA	NA	NA	NA
Alkalinity in mg/L	NA	151	177	NA	NA	NA	NA
Hardness in mg/L	NA	60	64	NA	NA	NA	NA
Chloride in mg/L	NA	5.3 J	7.5 J	NA	NA	NA	NA
Sulfate in mg/L	NA	1 UJ	1 UJ	NA	NA	NA	NA
Phosphate in mg/L	NA	0.4 UJ	0.4 UJ	NA	NA	NA	NA

NA - not analyzed for
* - fully validated sample

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	B06305	B062S9	B062T2	B062T5	*B06311	*B062X1	B062X8
Analytes of Concern:							
Ammonia in mg/L	0.08 J	0.05 UJ	0.08 J	0.08 J	0.11 J	0.13 J	0.08 J
Fluoride in mg/L	1.3 J	0.3 J	1.3 J	1.6 J	0.4 J	0.4 J	0.4 J
Nitrate in mg/L	0.2 UJ	4.9 J	0.2 UJ	0.2 UJ	3.1 J	3.1 J	3.4 J
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ
pH	8.1 J	7.9 J	8.2 J	8 J	7.6 J	7.9 J	7.9 J
Additional Analytes:							
COD in mg/L	NA	NA	NA	NA	NA	NA	NA
TDS in mg/L	NA	NA	NA	NA	NA	NA	NA
TSS in mg/L	NA	NA	NA	NA	NA	NA	NA
Alkalinity in mg/L	NA	NA	NA	NA	NA	NA	NA
Hardness in mg/L	NA	NA	NA	NA	NA	NA	NA
Chloride in mg/L	NA	NA	NA	NA	NA	NA	NA
Sulfate in mg/L	NA	NA	NA	NA	NA	NA	NA
Phosphate in mg/L	NA	NA	NA	NA	NA	NA	NA

NA – not analyzed for
* – fully validated sample

Table 5-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Analysis and Qualifier Summary

Sample No.:	B062Y7	B062W1	B062Y4	B062Z0
Analytes of Concern:				
Ammonia in mg/L	0.07 J	0.11 J	0.08 J	0.15 J
Fluoride in mg/L	0.4 J	0.4 J	0.4 J	0.2 J
Nitrate in mg/L	2.4 J	2.8 J	3.3 J	2.2 J
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	0.1 UJ	0.1 UJ
pH	8.6 J	7.8 J	7.8 J	7.4
Additional Analytes:				
COD in mg/L	NA	NA	NA	NA
TDS in mg/L	NA	NA	NA	NA
TSS in mg/L	NA	NA	NA	NA
Alkalinity in mg/L	NA	NA	NA	NA
Hardness in mg/L	NA	NA	NA	NA
Chloride in mg/L	NA	NA	NA	NA
Sulfate in mg/L	NA	NA	NA	NA
Phosphate in mg/L	NA	NA	NA	NA

NA - not analyzed for
♦ - fully validated sample

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Table 5-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 TOC/TOX
Analysis and Qualifier Summary

Sample No.: Appendix No.:	*B062C9 AK	*B062N3 AK	*B06304 AK	*B062M7 AL	*B062F4 AL	*B062G3 AL	*B062G6 AL	B062D5 AM	B062F7 AM	B062B7 AN
Total Organic Carbon (TOC) in mg/L	2.1	1.2	1.9	2.5	1	3.3	2.4	1.5	0.64	2.5
Total Organic Halides (TOX) in µg/L	16 J	5 UJ	15.4 J	5 J	7.1 J	17.4 J	5 J	39.2 J	39.8 J	85.8 J

* - fully validated sample

JOBS\297850\Table5-2.wk1

Table 5-3. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Data Package Completeness Verification Results Checklist

Data Package Item	Case Number								
	9205L191	04-077	04-070	04-045	05-043	04-083	9204L147	9204L132	9204L004
Case Narrative	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Reports/Chain of Custody	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample Analysis Data Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Standards Data	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
QC Summary									
Blanks Summary Report Forms	Yes	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes
Spike Sample Recovery Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Duplicate Sample Analysis Report Forms	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Laboratory Control Sample Report Forms	Yes	N/A	N/A	N/A	N/A	N/A	Yes	Yes	Yes
Raw Data									
Ion Chromatograph Chromatograms	N/A	Yes	Yes	Yes	Yes	X	N/A	N/A	N/A
TOC/TOX Instrument Printouts	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes
Laboratory Bench Sheets	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Data									
Laboratory Sample Preparation Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Internal Laboratory Chain of Custody	Yes	Yes	Yes	Yes	N/A	Yes	N/A	Yes	N/A
%Solids Analysis records	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No	No	No	No	No	No

Table 5-3. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Data Package Completeness Verification Results Checklist

Data Package Item	Case Number			
	9204L113	9204L104	04-072	06-039
Case Narrative	Yes	Yes	Yes	Yes
Cover Page	Yes	Yes	Yes	Yes
Traffic Reports/Chain of Custody	Yes	Yes	Yes	Yes
Sample Analysis Data Report Forms	Yes	Yes	Yes	Yes
Standards Data	Yes	Yes	Yes	Yes
QC Summary				
Blanks Summary Report Forms	Yes	Yes	N/A	N/A
Spike Sample Recovery Report Forms	Yes	Yes	Yes	Yes
Duplicate Sample Analysis Report Forms	Yes	Yes	Yes	Yes
Laboratory Control Sample Report Forms	Yes	Yes	N/A	N/A
Raw Data				
Ion Chromatograph Chromatograms	N/A	N/A	Yes	Yes
TOC/TOX Instrument Printouts	Yes	Yes	N/A	N/A
Laboratory Bench Sheets	Yes	Yes	Yes	Yes
Additional Data				
Laboratory Sample Preparation Logs	N/A	N/A	N/A	N/A
Instrument Run Logs	N/A	N/A	N/A	N/A
Internal Laboratory Chain of Custody	N/A	N/A	N/A	Yes
%Solids Analysis records	N/A	N/A	N/A	N/A
Reduction Formulae	N/A	N/A	N/A	N/A
Chemist Notebook Pages	N/A	N/A	N/A	N/A
Does Missing Item(s) Affect Data Quality?	No	No	No	No

6.0 GROSS ALPHA AND GROSS BETA DETERMINATION DATA VALIDATION AND LIMITATIONS

6.1 SUMMARY

6.1.1 Three Sample Delivery Groups

Sample results for gross alpha and gross beta analyses for the following three radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		
Weston	9204L071	2	2

Data qualifiers assigned to the gross alpha and gross beta results for these cases are summarized in Table 6-1.

6.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

6.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

6.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 6-1. An arbitrary criterion was established to reject results with more than three deficiencies. No results were found meeting this criterion.

6.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of all gross alpha and gross beta results contained in the TMA packages. Lack of precision and accuracy information resulted in qualifying all gross alpha and gross beta results contained in the Weston package.

6.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the gas proportional counter used for gross alpha and gross beta determination is capable of producing acceptable and reliable analytical data. The initial calibration for TMA and Weston was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency as a function of alpha or beta particle energy, as well as the mass of material submitted for counting. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

6.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of alpha or beta emitting radionuclides. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

6.3.1 Accuracy Acceptable for All TMA Sample Results

The accuracy was acceptable for gross alpha and gross beta determination of all samples.

6.3.2 Accuracy Not Determined for Weston Results

No spikes were analyzed with the Weston data. According to the letter submitted with this data package, spikes were omitted at the request of Westinghouse Hanford. Since method accuracy cannot be determined the two results are qualified as estimates (J or UJ).

6.4 PRECISION UNACCEPTABLE FOR ALL SAMPLES

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

Method precision either exceeded the applicable control limit or could not be determined for all TMA replicates. This trend resulted in all TMA sample results being qualified as estimated (J or UJ). No replicates were analyzed with the Weston data. According to the letter submitted with this data package, replicates were omitted at the request of Westinghouse Hanford. Since method accuracy cannot be determined the two results are qualified as estimates (J or UJ). Only two samples were replicated for the TMA data package instead of four as required. No additional qualifiers are assigned as a result of this oversight.

6.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). Nine samples from the TMA data results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

6.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA and Weston instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses. Weston provided the information required to make this determination as supplemental information to the data package.

6.7 DATA PACKAGES NEARLY COMPLETE

In addition to validating gross alpha and gross beta results for the three discussed above, data for gross alpha and gross beta analyses in each of the five Second Round Groundwater radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 6-2. All key deliverables were supplied by TMA. Weston sample results did not include all QA data. Some of the missing QA information was provided later as supplemental information. This supplemental information has been filed with the original data package.

6.8 QUALIFIERS CHANGED FROM PRELIMINARY QA REPORT

In the Preliminary QA Report for the Weston package, all gross alpha and gross beta results were rejected due to missing information. Due to additional Weston information received since the Preliminary QA Report, Weston gross alpha and gross beta sample results are no longer rejected. These samples are still qualified as estimated (J or UJ) due to lack of precision and accuracy information.

Table 6-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Gross Alpha/Gross Beta Analysis and Qualifier Summary

Customer I.D. No.	Gross Alpha Results in pCi/L	Qualifier	Gross Beta Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & N2-05-006-7035				
* B062C7	26.000	J	15.00	J
* B062K4	0.560	UJ	6.30	J
* B062M2	3.200	J	6.60	J
* B062P9	1.300	UJ	5.40	J
* B062T2	-1.500	UJ	4.90	J
* B06302	1.000	UJ	4.10	J
* B06305	-0.510	J	1.30	UJ
* B06308	3.100	J	7.60	J
* B062C1	52.000	J	33.00	J
* B062F2	24.000	J	19.00	J
* B062F8	9.500	J	11.00	J
* B062L0	34.000	J	27.00	J
B062B8	9.700	J	13.000	J
B062C4	<MDA	UJ	4.900	J
B062D9	11.000	J	14.000	J
B062G1	<MDA	UJ	32.000	J
B062G4	4.300	J	7.500	J
B062G7	<MDA	UJ	6.100	J
B062H0	5.400	J	9.700	J
B062H3	<MDA	UJ	4.800	J
B062H6	<MDA	UJ	8.800	J
B062H9	3.5, U	J	5.100	J
B062J2	<MDA	UJ	3.6	J
B062J5	<MDA	UJ	5.500	J
B062J8	<MDA	UJ	<MDA	UJ
B062K1	8.700	J	10.000	J
B062K7	<MDA	UJ	6.300	J
B062L3	<MDA	UJ	3.8	J
B062L6	<MDA	UJ	5.500	J
B062L9	<MDA	UJ	3.5	J
B062N1	19.000	J	16.000	J
B062N4	<MDA	UJ	9.400	J
B06200	5.800	J	7.900	J
B062T5	<MDA	UJ	5.000	J
B062M5	<MDA	UJ	32.000	J
B062M8	<MDA	UJ	3.6	J
B062S9	<MDA	UJ	10.000	J
Weston 9204L071				
* B062Z9	<2	UJ	8.6	J
* B062Z6	<2	UJ	10	J

* - Fully validated sample

<MDA - less than minimum detectable amount

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Table 6-2. 300-FF-5 Operable Unit Remedial Investigation Gross Alpha/Gross Beta Completeness Verification Summary

Groundwater Round 2 Gross Alpha/Gross Beta

Data Package Completeness Verification Results

Data Package Item	Case Number			
	N2-05-107-7044	N2-06-106-7051	N2-06-006-7035/7033	9204L071
Case Narrative	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes
Analysis Results				
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes	Yes
Initial and Continuing Calibration				
Detector Indentification	Yes	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes	Yes
Effciencies	Yes	Yes	Yes	Yes
Weight of Carriers Added, If Applicable	N/A	N/A	N/A	N/A
Results of Staticstical Test Used to Evaluate Instrument Reliability and Efficiency Checks	N/A	N/A	N/A	No
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes	Yes
Results of Statistical Test Uesd to Evaluate Instrument Background	N/A	N/A	N/A	Yes
Control Limits for Check Source and Background Counts	N/A	N/A	N/A	Yes
Blanks				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes	N/A
Radiometric and Gravimetric Yields				
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	N/A	N/A	N/A	Yes
Weights of Precipitates	N/A	N/A	N/A	Yes
Calculated Recoveries	N/A	N/A	N/A	N/A
Duplicates				
Detector Identification	Yes	Yes	Yes	No
Date of Analysis	Yes	Yes	Yes	No
Aliquuots of Samples	Yes	Yes	Yes	No
Weight of Solids Counted	Yes	Yes	Yes	No
Count Durations	Yes	Yes	Yes	No
Sample Identifications	Yes	Yes	Yes	No
Calculated Precision	Yes	Yes	Yes	No
Laboratry Control Samples				
Detector Identification	Yes	Yes	Yes	No
Date of Analysis	Yes	Yes	Yes	No
Calculation of Recoveries	Yes	Yes	Yes	No
Result of Analyses	Yes	Yes	Yes	No
Does Missing Item(s) Affect Data Quality	No	No	No	Yes

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7.0 STRONTIUM 90 DETERMINATION DATA VALIDATION AND LIMITATIONS

7.1 SUMMARY

7.1.1 Three Sample Delivery Groups

Sample results for strontium 90 (Sr90) analyses from the following three radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		
Weston	9204L071	2	2

Data qualifiers assigned to the Sr90 results for these cases are summarized in Table 7-1.

7.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

7.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

7.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 7-1. An arbitrary criterion was

established to reject results with more than three deficiencies. No results were found meeting this criterion.

7.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of all Sr90 results contained in the TMA packages.

7.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the low background counting system used for Sr90 determination is capable of producing acceptable and reliable analytical data. The initial calibration for TMA and Weston was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

7.3 ACCURACY ACCEPTABLE FOR ALL SAMPLES

Accuracy was evaluated by analyzing samples spiked with known amounts of Sr90. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

The accuracy was acceptable for Sr90 determination of all samples.

7.4 PRECISION

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

7.4.1 Precision Unacceptable for All TMA Samples

Method precision either exceeded the applicable control limit or could not be determined for all replicates. This trend resulted in all sample results being qualified as estimated (J or UJ). Only two samples were replicated for the TMA data package instead of four as required. No additional qualifiers are assigned as a result of this oversight.

7.4.2 Precision Acceptable for Weston Samples

Matrix spike and matrix spike duplicate results with this data delivery group indicate acceptable method precision.

7.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). Ten samples from the TMA data results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

7.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA and Weston instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses.

7.7 DATA PACKAGES COMPLETE

In addition to validating Sr90 results for the three packages discussed above, data for Sr90 analyses in each of the five Second Round Groundwater radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 7-2.

7.8 QUALIFIERS CHANGED FROM PRELIMINARY QA REPORT

In the Preliminary QA Report for Weston, all Sr90 results were rejected due to missing information. Due to additional Weston information received since the Preliminary QA Report, Weston Sr90 sample results are no longer rejected.

Table 7-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Strontium 90
Analysis and Qualifier Summary

Customer I.D. No.	Strontium 90 Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 &		
TMA/Norcal case N2-05-006-7035		
* B062C7	0.780	UJ
* B062K4	0.081	UJ
* B062M2	0.280	UJ
* B062P9	0.720	UJ
* B062T2	-0.230	UJ
* B06302	0.440	UJ
* B06305	0.180	UJ
* B06308	0.240	UJ
* B062C1	-0.380	UJ
* B062F2	0.160	UJ
* B062F8	0.430	UJ
* B062L0	0.130	UJ
B062B8	<MDA	UJ
B062C4	<MDA	UJ
B062D9	<MDA	UJ
B062G1	<MDA	UJ
B062G4	<MDA	UJ
B062G7	<MDA	UJ
B062H0	<MDA	UJ
B062H3	<MDA	UJ
B062H6	<MDA	UJ
B062H9	<MDA	UJ
B062J2	<MDA	UJ
B062J5	<MDA	UJ
B062J8	<MDA	UJ
B062K1	<MDA	UJ
B062K7	<MDA	UJ
B062L3	<MDA	UJ
B062L6	<MDA	UJ
B062L9	<MDA	UJ
B062N1	<MDA	UJ
B062N4	<MDA	UJ
B06200	<MDA	UJ
B062T5	<MDA	UJ
B062M5	<MDA	UJ
B062M8	<MDA	UJ
B062S9	<MDA	UJ
Weston 9204L071		
* B062Z9	<1.0	U
* B062Z6	<0.6	U

* - Fully validated sample

<MDA - Less than minimum detectable amount

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Table 7-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Strontium 90
Data Package Completeness Verification Results

Data Package Item	Case Number			
	N2-05-107-7004	N2-06-106-7051	N2-06-006-7033/7033	9204L071
Case Narrative	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes
Analysis Results				
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes	Yes
Initial and Continuing Calibration				
Detector Indentification	Yes	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes	Yes
Amount of (Check) Standard Used	Yes	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes	Yes
Effciencies	Yes	Yes	Yes	Yes
Weight Carriers Added, If Applicable	Yes	Yes	Yes	Yes
Results of Statiestical Test Used to Evaluate Instrument Reliability and Efficiency Checks	Yes	Yes	Yes	Yes
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes	Yes
Results of Statistical Test Uesd to Evaluate Instrument Background	Yes	Yes	Yes	Yes
Control Limits for Check Source and Background Counts	N/A	N/A	N/A	N/A
Blanks				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
MDA of Method	Yes	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes	Yes
Radiometric and Gravimetric Yields				
Amounts (Volumes, Concentrations, Activity) of Spikes, Tracers, or Carriers Used	Yes	Yes	Yes	Yes
Weights of Precipitates	Yes	Yes	Yes	Yes
Calculated Recoveries	Yes	Yes	Yes	Yes
Duplicates				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
Aliquuots of Samples	Yes	Yes	Yes	Yes
Weight of Solids Counted	Yes	Yes	Yes	N/A
Count Durations	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Calculated Precision	Yes	Yes	Yes	Yes
Laboratry Control Samples				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes	Yes
Does Missing Item(s) Affect Data Quality	No	No	No	No

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8.0 TECHNETIUM 99 DETERMINATION DATA VALIDATION AND LIMITATIONS

8.1 SUMMARY

8.1.1 Two Sample Delivery Groups

Sample results for technetium 99 (Tc99) analyses from the following two radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		

Data qualifiers assigned to the Tc99 results for these cases are summarized in Table 8-1.

8.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

8.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

8.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 8-1. An arbitrary criterion was

established to reject results with more than three deficiencies. No results were found meeting this criterion.

8.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of all Tc99 results contained in the TMA packages.

8.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the low background counting system used for Tc99 determination is capable of producing acceptable and reliable analytical data. The initial calibration for TMA was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

8.3 ACCURACY ACCEPTABLE

Accuracy was evaluated by analyzing samples spiked with known amounts of Tc99. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

The accuracy was acceptable for Tc99 determination of all samples.

8.4 PRECISION UNACCEPTABLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

Method precision could not be determined for any replicates. This trend resulted in all sample results being qualified as estimated (J or UJ). Only two samples were replicated for the TMA data packages instead of four as required. No additional qualifiers are assigned as a result of this oversight.

8.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). Seventeen samples from the TMA data results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

8.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses.

8.7 ALL DATA PACKAGES COMPLETE

In addition to validating Tc99 results for the two packages discussed above, data for Tc99 analyses in each of the four Second Round Groundwater radiochemistry packages where Tc99 analyses were performed were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 8-2. In no case were key deliverables noted to be missing.

Table 8-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Technetium 99
Analysis and Qualifier Summary

Customer I.D. No.	Technetium 99 Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & TMA/Norcal case N2-05-006-7035		
* B062C7	2.000	UJ
* B062K4	0.980	UJ
* B062M2	0.440	UJ
* B062P9	NR	NA
* B062T2	NR	NA
* B06302	2.800	UJ
* B06305	NR	NA
* B06308	NR	NA
* BO62C1	3.200	UJ
* BO62F2	7.700	J
* BO62F8	2.1	UJ
* BO62L0	5.700	UJ
B062B8	9.400	J
B062C4	<MDA	UJ
B062D9	5.600	J
B062G1	65	J
B062G4	4.8	J
B062G7	<MDA	UJ
B062H0	8.3	J
B062H3	<MDA	UJ
B062H6	7.4	UJ
B062H9	11	J
B062J2	<MDA	UJ
B062J5	<MDA	UJ
B062J8	<MDA	UJ
B062K1	<MDA	UJ
B062K7	<MDA	UJ
B062L3	<MDA	UJ
B062L6	5.0	UJ
B062L9	5.7	UJ
B062N1	<MDA	UJ
B062N4	<MDA	UJ
B06200	6.2	J
B062T5	NR	NA
B062M5	64	J
B062M8	<MDA	UJ
B062S9	NR	NA
Weston 9204L071		
* B062Z9	NR	NA
* B062Z6	NR	NA

* - Fully validated sample
<MDA - Less than minimum detectable amount
NA - Not applicable
NR - Not requested

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Table 8-2. 300-FF-5 Operable Unit Remedial Investigation Groundwater, Round 2 Technetium 99 Data Package Completeness Verification Results

Data Package Item	Case Number		
	N2-05-107-7044	N2-06-106-7051	N2-06-006-7035/7033
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Weights of Solids Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards			
including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Weights of Preparations	Yes	Yes	Yes
Effciencies	Yes	Yes	Yes
Weight of Carriers Added, If Applicable	N/A	N/A	N/A
Results of Statistical Test Used to Evaluate			
Instrument Reliability and Efficiency Checks	N/A	N/A	N/A
Raw Data of Background Counts and Count Duration	Yes	Yes	Yes
Results of Statistical Test Used to Evaluate Instrument Background	N/A	N/A	N/A
Control Limits for Check Source and Background Counts	N/A	N/A	N/A
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of			
Spikes, Tracers, or Carriers Used	Yes	Yes	Yes
Weights of Precipitates	Yes	Yes	Yes
Calculated Recoveries	Yes	Yes	Yes
Duplicates			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Aliquots of Samples	Yes	Yes	Yes
Weight of Solids Counted	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Calculated Precision	Yes	Yes	Yes
Laboratry Control Samples			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
Calculation of Recoveries	Yes	Yes	Yes
Result of Analyses	Yes	Yes	Yes
Does Missing Item(s) Affect Data Quality	No	No	No

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9.0 ISOTOPIC URANIUM DETERMINATION DATA VALIDATION AND LIMITATIONS

9.1 SUMMARY

9.1.1 Three Sample Delivery Groups

Sample results for isotopic uranium analyses from the following three radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		
Weston	9204L071	2	2

Data qualifiers assigned to the isotopic uranium results, including uranium 234 (U234), uranium 235 (U235), and uranium 238 (U238), for these cases are summarized in Table 9-1.

9.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

9.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

9.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 9-1. An arbitrary criterion was established to reject results with more than three deficiencies. No results were found meeting this criterion.

9.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of all isotopic uranium results contained in the TMA packages. In addition, poor method accuracy was observed in the case of U235 results. Lack of precision and accuracy information resulted in qualifying all isotopic uranium results contained in the Weston package.

9.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration was performed at TMA and Weston to establish that the alpha spectroscopy system used for isotopic uranium determination is capable of producing acceptable and reliable analytical data. The initial calibration for TMA and Weston was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency for each alpha energy, system resolution, and the full-width at half maximum for each peak. In addition, the isotopic uranium method employs the addition of a National Institute of Standards and Testing (NIST) traceable U232 internal reference standard. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

9.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of uranium isotopes. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

9.3.1 Accuracy Unacceptable for All TMA U235 Sample Results

All U235 results were qualified estimated (J or UJ) due to poor accuracy. Accuracy was acceptable for all U234 and U238 results.

9.3.2 Accuracy Not Determined for Weston Results

No spikes were analyzed with the Weston data thus method accuracy cannot be determined. All results are qualified as estimates (J or UJ).

9.4 PRECISION UNACCEPTABLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

Method precision either exceeded the applicable control limit or could not be determined for all replicates. This trend resulted in all sample results being qualified as estimated (J or UJ). Only two samples were replicated for the TMA data packages instead of four as required. No additional qualifiers are assigned as a result of this oversight.

9.5 BLANK CONTAMINATION DETECTED IN TMA QA SAMPLES

Reagent (method) blanks are analyzed with each sample delivery group to detect potential analyte contamination in chemical reagents used to prepare samples for counting. The level of analyte in the blank should be less than the MDA. If blank levels greater than the MDA are detected, associated sample results greater than the MDA are qualified as estimated detects (J) unless the result is at least 10 times greater than the blank contaminant level. Sample results less than the blank contaminant result are qualified as nondetects (U).

Contamination was detected above the MDA for U234 and U238 in one of the two reagent blanks analyzed by TMA with these samples. As a result of this contamination, fourteen U234 and thirteen U238 sample results associated with these blanks were qualified as estimated detects (J).

9.6 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). No results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

9.7 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses.

9.8 WESTON DATA PACKAGE INCOMPLETE

In addition to isotopic uranium results for the three packages discussed above, data for isotopic uranium analyses in each of the four Second Round Groundwater radiochemistry packages where isotopic uranium analyses were performed were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 9-2. All key deliverables were supplied by TMA. Weston sample results did not include all QA data. Some of the missing QA information was provided later as supplemental information. This supplemental information has been filed with the original data package.

9.9 QUALIFIERS CHANGED FROM PRELIMINARY QA REPORT

In the preliminary report for the Weston package, all isotopic uranium results were rejected due to missing information. Due to the additional information received since the Preliminary QA Report, Weston isotopic uranium sample results are no longer rejected. These samples are still qualified as estimated (J or UJ) due to lack of precision and accuracy information.

Table 9-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Isotopic Uranium Analysis and Qualifier Summary

Customer I.D. No.	U234 Results in pCi/L	Qualifier	U235 Results in pCi/L	Qualifier	U238 Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & N2-05-006-7035						
* B062C7	14	J	1.8	J	11	J
* B062K4	0.18	J	0.007	UJ	0.14	J
* B062M2	0.2	J	0.004	UJ	0.23	J
* B062P9	0.048	UJ	0	UJ	0.048	UJ
* B062T2	0.17	J	0.09	UJ	0.19	J
* B06302	16	J	1.8	J	13	J
* B06305	0.22	J	0.015	UJ	0.22	J
* B06308	2.8	J	0.19	J	2.6	J
* BO62C1	54	J	5.8	J	37	J
* BO62F2	18	J	1.5	J	17	J
* BO62F8	8.1	J	0.51	J	8.4	J
* BO62L0	35	J	4	J	27	J
B062B8	11	J	0.84	J	9.6	J
B062C4	0.67	J	<MDA	UJ	0.49	J
B062D9	11	J	0.8	J	9.8	J
B062G1	2.7	UJ	<MDA	UJ	2.3	UJ
B062G4	3.1	J	<MDA	UJ	3.2	UJ
B062G7	1.3	UJ	<MDA	UJ	1.2	UJ
B062H0	2.3	UJ	<MDA	UJ	2.0	UJ
B062H3	<MDA	UJ	<MDA	UJ	<MDA	UJ
B062H6	<MDA	UJ	<MDA	UJ	<MDA	UJ
B062H9	2.7	UJ	<MDA	UJ	2.2	UJ
B062J2	1.3	J	0.096	J	0.99	J
B062J5	0.55	J	<MDA	UJ	0.49	J
B062J8	0.48	J	<MDA	UJ	0.39	J
B062K1	5.0	UJ	0.36	UJ	4.2	UJ
B062K7	.28	UJ	<MDA	UJ	.29	UJ
B062L3	0.63	J	<MDA	UJ	0.56	J
B062L6	2.2	J	0.081	J	2.1	J
B062L9	<MDA	UJ	<MDA	UJ	<MDA	UJ
B062N1	0.34	J	<MDA	UJ	0.22	J
B062N4	0.46	J	<MDA	UJ	0.31	J
B06200	4.3	UJ	<MDA	UJ	3.8	UJ
B062T5	0.51	J	<MDA	UJ	0.46	J
B062M5	2.3	J	0.11	J	1.9	J
B062M8	<MDA	UJ	<MDA	UJ	<MDA	UJ
B062S9	2.3	J	0.19	J	1.6	J
Weston 9204L071						
* B062Z9	NR	NA	<0.08	UJ	0.210	UJ
* B062Z6	NR	NA	<0.1	UJ	<0.2	UJ

* - Fully validated sample

<MDA - Less than minimum detectable amount

NA - Not applicable

NR - Not requested

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Table 9-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Isotopic Uranium
Data Package Completeness Verification Results

Data Package Item	Case Number		
	N2-06-106-7051	N2-06-006-7035/7033	9204L071
Case Narrative	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes
Analysis Results			
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes
Raw Data (Counting Logs, Printouts, Notebook Pages)	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes
Amounts of Samples Prepared or Counted	Yes	Yes	Yes
Initial and Continuing Calibration			
Detector Indentification	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes
Identification of Calibration and Check Standards			
including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes
Amount of (Check) Used	N/A	N/A	N/A
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes
Kev/channel	N/A	N/A	Yes
Count Duration for Standards	N/A	N/A	N/A
Efficiencies	Yes	Yes	Yes
Raw Data of Background Counts , Dates Counted, and Duration of Counts	N/A	N/A	N/A
Blanks			
Detector Identification	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes
MDA Method	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	No
Duplicates			
Detector Identification	Yes	Yes	No
Date of Analysis	Yes	Yes	No
Amounts of Solids Counted	Yes	Yes	No
Count Durations	Yes	Yes	No
Sample Identifications	Yes	Yes	No
Calculated Precision	Yes	Yes	No
Radiometric and Gravimetric Yields			
Amounts (Volumes, Concentrations, Activity) of			
Spikes, Tracers, or Carriers Used	Yes	Yes	No
Weights of Precipitates	Yes	Yes	No
Calculated Recoveries	Yes	Yes	No
Laboratry Control Samples			
Detector Identification	Yes	Yes	No
Date of Analysis	Yes	Yes	No
Calculation of Recoveries	Yes	Yes	No
Result of Analyses	Yes	Yes	No
Does Missing Item(s) Affect Data Quality	No	No	Yes

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10.0 TOTAL URANIUM DETERMINATION DATA VALIDATION AND LIMITATIONS

10.1 SUMMARY

10.1.1 Three Sample Delivery Groups

Sample results for total uranium analyses from the following three radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		
Weston	9204L071	2	2

Data qualifiers assigned to the total uranium results for these cases are summarized in Table 10-1.

10.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

10.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

10.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 10-1. An arbitrary criterion was established to reject results with more than three deficiencies. No results were found meeting this criterion.

10.1.5 Data Quality Objectives Met

Data quality objectives were met for all results with the exception of the two from Weston. Major data quality deficiencies were uncovered in the Weston package, including missing information required to complete data validation such as initial calibration information, duplicate sample results, laboratory control sample results, raw data, and analytical procedures.

10.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration was performed at TMA to establish that the alpha spectroscopy system used for total uranium determination is capable of producing acceptable and reliable analytical data. The initial calibration for TMA was performed according to the manufacturer's recommendations and consists of determining the instrument detection characteristics for laser induced phosphorescence in the uranium samples and to develop a calibration curve. In addition, the total uranium method employs addition of a National Institute of Standards and Testing (NIST) traceable uranium reference standard that is analyzed with each sample. No data were qualified as a result of instrument calibration deficiencies.

At Weston, a Scintrex fluorometer was used for total uranium determination. Calibration information provided after the Preliminary QA Report was submitted indicated that calibration was performed but a clear history of calibration could not be developed. Based on available information, these results are no longer rejected as identified in the Preliminary QA Report, but will be qualified as estimated (J).

10.3 ACCURACY ACCEPTABLE

Accuracy was evaluated by analyzing samples spiked with known amounts of uranium. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

Accuracy was acceptable for all total uranium results.

10.4 PRECISION NOT DETERMINED FOR WESTON SAMPLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

Method precision was not determined for Weston total uranium analysis. According to the cover letter included with the data package, the duplicate sample was excluded at the request of Westinghouse Hanford. Since method precision cannot be determined, the two Weston total uranium results are qualified as estimates.

10.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). No data results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

10.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses. Weston did not provide the information required to make this determination. However, a review of the analytical results indicates that instrument performance could be assessed as adequate if the missing information is provided.

10.7 WESTON DATA PACKAGES NEARLY COMPLETE

In addition to the total uranium results for the three packages discussed above, data for total uranium analyses in each of the five Second Round Groundwater radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 10-2. All key deliverables were supplied by TMA. Weston sample results did not include all QA data. Some of the missing QA information was provided later as supplemental information. This supplemental information has been filed with the original data package.

10.8 QUALIFIERS CHANGED FROM PRELIMINARY QA REPORT

In the preliminary report for the Weston package, all total uranium results were rejected due to missing information. Due to the additional information received since the Preliminary QA Report, Weston total uranium sample results are no longer rejected. These samples are still qualified as estimated (J) due to lack of some calibration and QA information.

Table 10-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Total Uranium Analysis and Qualifier Summary

Customer I.D. No.	Total U Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & TMA/Norcal case N2-05-006-7035		
* B062C7	42	
* B062K4	0.045	
* B062M2	<MDA	U
* B062P9	NR	NA
* B062T2	NR	NA
* B06302	38	
* B06305	NR	NA
* B06308	NR	NA
* BO62C1	110	
* BO62F2	50	
* BO62F8	25	
* BO62L0	82	
B062B8	23	
B062C4	<MDA	U
B062D9	32	
B062G1	7.3	
B062G4	10	
B062G7	3.1	
B062H0	1.9	
B062H3	0.039	
B062H6	<MDA	U
B062H9	5.9	
B062J2	2.1	
B062J5	<MDA	U
B062J8	0.021	
B062K1	0.71	
B062K7	<MDA	U
B062L3	0.039	
B062L6	4.6	
B062L9	<MDA	U
B062N1	<MDA	U
B062N4	0.066	
B06200	14	
B062T5	NR	NA
B062M5	5.3	
B062M8	0.077	
B062S9	NR	NA
Weston 9204L071		
* B062Z9	0.19	J
* B062Z6	0.06	J

* - Fully validated sample
<MDA - Less than minimum detectable amount
NA - Not applicable
NR - Not required

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Table 10-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Total Uranium
Data Package Completeness Verification Results

Data Package Item	Case Number			
	N2-05-107-7044	N2-06-106-7051	N2-06-006-7035/7033	9204L071
Case Narrative	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes
Analysis Results				
Results Report for Sample Analyses	Yes	Yes	Yes	Yes
Raw Data (including Prep Volume, Aliquot Volume, KpA output)	Yes	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes	N/A
Initial and Continuing Calibration				
Detector Indentification	Yes	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes	Yes
Identification of Calibration and Check Standards including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes	No
Amount of Standard Used	Yes	Yes	Yes	Yes
Raw Data Count /Activity data	Yes	Yes	Yes	No
Determination of Calibration Equation	Yes	Yes	Yes	Yes
Blanks/Backgrounds				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
MDA of Method	Yes	Yes	Yes	No
Amounts of Reagents Used (Prep Volume)	Yes	Yes	Yes	Yes
Duplicates				
Detector Identification	Yes	Yes	Yes	No
Date of Analysis	Yes	Yes	Yes	No
Amounts of Samples	Yes	Yes	Yes	No
Count Durations	Yes	Yes	Yes	No
Sample Identifications	Yes	Yes	Yes	No
Results of Analyses and Calculated Precision	Yes	Yes	Yes	No
Raw Data	Yes	Yes	Yes	No
Matrix Spikes				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
Amounts of Samples	Yes	Yes	Yes	Yes
Count Durations	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Results of Analyses and Calculated Precision	Yes	Yes	Yes	Yes
Identification of Matrix Spike Radionuclide, Certification, Expiration Date and Activity	Yes	Yes	Yes	Yes
Amount of Matrix Spike Used	Yes	Yes	Yes	Yes
Raw Data	Yes	Yes	Yes	Yes
Results of Analysis and Comparison to Amount Added	Yes	Yes	Yes	Yes
Does Missing Item(s) Affect Data Quality	No	No	No	Yes

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11.0 GAMMA SPECTROSCOPY DATA VALIDATION AND LIMITATIONS

11.1 SUMMARY

11.1.1 Three Sample Delivery Groups

Sample results for gamma spectroscopy analyses from the following three radiochemistry cases are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
TMA	N2-05-006-7035	37	8
TMA	N2-05-006-7033		
Weston	9204L071	2	2

Data qualifiers assigned to the gamma spectroscopy results for these cases are summarized in Table 11-1.

11.1.2 All Samples Validated

Results for all of the sample analyses for the cases listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for each of these three packages. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

11.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

11.1.4 One Qualifier Assigned

More than one deficiency was discovered for several sample results. However, only the most serious of these is reported in Table 11-1. An arbitrary criterion was

established to reject results with more than three deficiencies. No results were found meeting this criterion.

11.1.5 Data Quality Objectives Not Met

Poor precision resulted in qualification of all gamma spectroscopy results contained in the TMA packages. Lack of precision and accuracy information resulted in qualifying all gamma spectroscopy results contained in the Weston package.

11.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the gamma spectroscopy system used is capable of producing acceptable and reliable analytical data. The initial calibration for TMA and Weston was performed according to the manufacturer's recommendations and consists of determining the instrument detection efficiency for each gamma energy, system resolution, and the full-width at half maximum for each peak. Initial calibration was performed for each counting geometry used during analysis of Westinghouse Hanford samples. Continuing calibration checks are performed to verify that instrument performance is stable and reproducible on a day to day basis. No data were qualified as a result of instrument calibration deficiencies.

11.3 ACCURACY

Accuracy was evaluated by analyzing samples spiked with known amounts of gamma emitting radionuclides. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

11.3.1 Accuracy Acceptable for All TMA Sample Results

The accuracy was acceptable for gross alpha and gross beta determination of all samples.

11.3.2 Accuracy Not Determined for Weston Results

No spikes were analyzed with the Weston data. According to the letter submitted with this data package, spikes were omitted at the request of WHC. Since method accuracy cannot be determined the two results are qualified as estimates (J or UJ).

11.4 PRECISION UNACCEPTABLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

- -Method precision either exceeded the applicable control limit or could not be determined for all replicates. This trend resulted in all sample results being qualified as estimated (J or UJ). No replicates were analyzed with the Weston data. According to the letter submitted with this data package, replicates were omitted at the request of Westinghouse Hanford. Since method accuracy cannot be determined the two results are qualified as estimates (J or UJ). Only two samples were replicated for the TMA data package instead of four as required. No additional qualifiers are assigned as a result of this oversight.

11.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). No results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

11.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of TMA and Weston instrument continuing calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses. Weston did not provide the information required to make this determination. However, a review of the analytical results indicates that instrument performance could be assessed as adequate if the missing information is provided.

11.7 DATA PACKAGES NEARLY COMPLETE

In addition to the gamma spectroscopy results for the three packages discussed above, data for gamma spectroscopy analyses in each of the five Second Round Groundwater radiochemistry packages were reviewed to verify that all deliverables normally supplied by the laboratories were present. The results of this review are summarized in Table 11-2. All key deliverables were supplied by TMA. Weston sample results did not include all QA data. Some of the missing QA information was provided later as supplemental information. This supplemental information has been filed with the original data package.

11.8 QUALIFIERS CHANGED FROM PRELIMINARY REPORT

In the preliminary report for the Weston package, all gamma spectroscopy results were rejected due to missing information. Due to the additional information received since the Preliminary QA Report, Weston gamma spectroscopy sample results are no longer rejected. These samples are still qualified as estimated (J or UJ) due to lack of precision and accuracy information.

Table 11-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Gamma Spectroscopy Analysis and Qualifier Summary

Customer I.D. No.	Cobalt 60 Results in pCi/L	Qualifier	Cesium 137 Results in pCi/L	Qualifier	Thorium 228 Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & N2-05-006-7035						
* B062C7	11	UJ	10	UJ	15	UJ
* B062K4	16	UJ	16	UJ	24	UJ
* B062M2	8.7	UJ	7.8	UJ	12	UJ
* B062P9	14	UJ	11	UJ	17	UJ
* B062T2	11	UJ	9.1	UJ	14	UJ
* B06302	18	UJ	14	UJ	22	UJ
* B06305	16	UJ	16	UJ	24	UJ
* B06308	9	UJ	6.1	UJ	11	UJ
* BO62C1	18	UJ	14	UJ	21	UJ
* BO62F2	10	UJ	9.5	UJ	15	UJ
* BO62F8	16	UJ	10	UJ	18	UJ
* BO62L0	19	UJ	11	UJ	20	UJ
B062B8	19	UJ	14	UJ	28	J
B062C4	28	UJ	12	UJ	21	UJ
B062D9	20	UJ	11	UJ	20	UJ
B062G1	18	UJ	9.1	UJ	20	UJ
B062G4	15	UJ	14	UJ	23	UJ
B062G7	15	UJ	14	UJ	20	UJ
B062H0	19	UJ	13	UJ	21	UJ
B062H3	18	UJ	15	UJ	24	UJ
B062H6	8.6	UJ	8	UJ	12	UJ
B062H9	12	UJ	8	UJ	13	UJ
B062J2	16	UJ	11	UJ	16	UJ
B062J5	13	UJ	12	UJ	19	UJ
B062J8	13	UJ	10	UJ	20	UJ
B062K1	15	UJ	11	UJ	30	UJ
B062K7	10	UJ	6.1	UJ	10	UJ
B062L3	14	UJ	14	UJ	21	UJ
B062L6	14	UJ	14	UJ	22	UJ
B062L9	35	UJ	16	UJ	21	UJ
B062N1	8.7	UJ	7.3	UJ	14	UJ
B062N4	12	UJ	12	UJ	22	UJ
B06200	15	UJ	15	UJ	28	UJ
B062T5	8.2	UJ	8.1	UJ	15	UJ
B062M5	19	UJ	13	UJ	20	UJ
B062M8	13	UJ	8.1	UJ	13	UJ
B062S9	12	UJ	12	UJ	24	UJ
Weston 9204L071						
* B062Z9	<6	UJ	<7	UJ	<10	UJ
* B062Z6	<6	UJ	<6	UJ	<10	UJ

* - Fully validated sample

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Table 11-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Gamma Spectroscopy
Data Package Completeness Verification Results

Data Package Item	Case Number			
	N2-05-107-7044	N2-06-106-7051	N2-06-006-7035/7033	9204L071
Case Narrative	Yes	Yes	Yes	Yes
Data Summary	Yes	Yes	Yes	Yes
Chain-of-Custody	Yes	Yes	Yes	Yes
Analysis Results				
Results Report for Sample Analyses and Reanalysis	Yes	Yes	Yes	Yes
Raw Data (Spectra, Printouts of Counts per Channel, Notebook Pages)	Yes	Yes	Yes	Yes
Calculation Sheets	Yes	Yes	Yes	Yes
Sample Identifications	Yes	Yes	Yes	Yes
Detector Indentification	Yes	Yes	Yes	Yes
Analysis Date and Initials of Analyst	Yes	Yes	Yes	Yes
Amounts of Samples Counted	Yes	Yes	Yes	Yes
Initial and Continuing Calibration				
Detector Indentification	Yes	Yes	Yes	Yes
Calibration Date(s) and Initials of Analyst	Yes	Yes	Yes	Yes
Identification of Calibration and Check Standards				
including Radionuclide Certification, Expiration Date and Activity	Yes	Yes	Yes	Yes
Amount of (Check) Standard Used	N/A	N/A	N/A	Yes
Raw Data including Counts and Count Duration for Standards	Yes	Yes	Yes	Yes
Effciencies and/or Geometry and Matrix Factors	Yes	Yes	Yes	Yes
Raw Data of Background Counts, Dates Counted, and Duration of Counts	Yes	Yes	Yes	Yes
Kev/channel	Yes	Yes	Yes	Yes
FWHM	Yes	Yes	Yes	Yes
Blanks				
Detector Identification	Yes	Yes	Yes	Yes
Date of Analysis	Yes	Yes	Yes	Yes
MDA of Method	Yes	Yes	Yes	Yes
Amounts of Reagents Used in Blank	Yes	Yes	Yes	No
Raw Data	Yes	Yes	Yes	Yes
Duplicates				
Detector Identification	Yes	Yes	Yes	No
Date of Analysis	Yes	Yes	Yes	No
Amounts of Samples	Yes	Yes	Yes	No
Count Durations	Yes	Yes	Yes	No
Sample Identifications	Yes	Yes	Yes	No
Results of Analyses and Calculated Precision	Yes	Yes	Yes	No
Raw Data	Yes	Yes	Yes	No
Radiometric and Gravimetric Yields				
Amounts (Volumes, Concentrations, Activity) of				
Spikes, Tracers, or Carriers Used	N/A	N/A	N/A	N/A
Weights of Precipitates or Solids Counted	N/A	N/A	N/A	N/A
Calculated Recoveries	N/A	N/A	N/A	N/A
Laboratry Control Samples				
Detector Identification	Yes	Yes	Yes	No
Date of Analysis	Yes	Yes	Yes	No
Calculation of Recoveries	Yes	Yes	Yes	No
Result of Analyses	Yes	Yes	Yes	No
Does Missing Item(s) Affect Data Quality	No	No	No	Yes

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12.0 TRITIUM DETERMINATION DATA VALIDATION AND LIMITATIONS

12.1 SUMMARY

12.1.1 One Sample Delivery Groups

Sample results for tritium analyses from the following radiochemistry case are included in this report:

Laboratory	Case Number	No. of Samples	No. Full Validated
Weston	9204L071	2	2

Data qualifiers assigned to the tritium results for these cases are summarized in Table 12-1.

12.1.2 All Samples Validated

Results for all of the sample analyses for the case listed above were validated, and data qualifiers assigned as appropriate. One hundred percent of the quality assurance sample results were recalculated, and quality control calculations verified, for the package. A limited number of samples, specified by Westinghouse Hanford, were fully validated (i.e., all sample results were recalculated from the laboratory raw data).

12.1.3 Westinghouse Hanford Guidance Used

Data validation was performed in accordance with the Westinghouse Hanford Data Validation Procedure for Radiological Analyses (WHC 1992b). Additional criteria established for the determination of laboratory performance were obtained from Westinghouse Hanford (DOE 1990), EPA CLP, and professional judgement.

12.1.4 One Qualifier Assigned

Both Weston tritium sample results were less than the MDA. There were no other qualifiers for these samples.

12.1.5 Data Quality Objectives Met

All major data quality objectives were met for these samples.

12.2 INSTRUMENT CALIBRATION ACCEPTABLE

Instrument calibration is performed to establish that the liquid scintillation counting system used for tritium determination is capable of producing acceptable and reliable analytical data. Instrument calibration information was found to be acceptable.

12.3 ACCURACY ACCEPTABLE

Accuracy was evaluated by analyzing samples spiked with known amounts of tritium. The sample activity as determined by sample analysis is compared to the known activity to assess method accuracy. The analytical result must be within 80 to 120 percent of the true value to be deemed acceptable. Spiked sample results outside this range would lead to associated data being qualified as estimated.

The accuracy was acceptable for tritium determination in all samples.

12.4 PRECISION ACCEPTABLE

Analytical precision is expressed by the relative percent difference (RPD) between the recoveries of duplicate matrix spike analyses performed on a sample. When the laboratory has not performed duplicate spike analyses, precision may also be assessed using unspiked samples provided the analyte activity is greater than the minimum detectable amount (MDA). If the analyte activity is less than the MDA for either the original or duplicate sample, precision cannot be determined. The control limit defining acceptable method precision is an RPD of less than 35% for replicates with activity levels 5 times the MDA or greater. If either replicate sample is less than 5 times the MDA, the difference between the two replicate values must be less than 2 times the MDA.

Matrix spike and matrix spike duplicate results indicate acceptable precision for the method.

12.5 COMPOUND QUANTIFICATION AND REPORTED DETECTION LIMITS

Compound quantifications and detection limits were recalculated for all samples in each data delivery package to verify that they are accurate and are consistent with Westinghouse Hanford requirements. Results below the MDA were qualified as nondetects (U) except in cases where the MDA was greater than the contract required detection limit (CRDL). In these cases, nondetects were qualified as estimated (UJ). No results were qualified for this deficiency. Results greater than the MDA were accepted as positive detects regardless of the CRDL.

12.6 SYSTEM PERFORMANCE ACCEPTABLE

A review of Weston instrument calibration information and quality control (QC) data indicates that instrument performance was adequate for these analyses.

12.7 DATA PACKAGE COMPLETE

In addition to validating tritium results, data for tritium in the Weston Second Round radiochemistry package were reviewed to verify that all deliverables normally supplied by the laboratory were present. All key information was provided for validating the tritium sample either in the original package or in supplemental data. Supplemental information is stored in the original data package file.

12.8 QUALIFIERS CHANGED FROM PRELIMINARY REPORT

In the preliminary report for the Weston package, all tritium results were rejected due to missing information. Due to the additional information received since the Preliminary QA Report, Weston tritium sample results are no longer rejected.

Table 12-1. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Tritium Determination Analysis and Qualifier Summary

Customer I.D. No.	Tritium Results in pCi/L	Qualifier
TMA/Norcal case N2-04-067-7033 & TMA/Norcal case N2-05-006-7035		
* B062C7	NR	NA
* B062K4	NR	NA
* B062M2	NR	NA
* B062P9	NR	NA
* B062T2	NR	NA
* B06302	NR	NA
* B06305	NR	NA
* B06308	NR	NA
* BO62C1	NR	NA
* BO62F2	NR	NA
* BO62F8	NR	NA
* BO62L0	NR	NA
B062B8	NR	NA
B062C4	NR	NA
B062D9	NR	NA
B062G1	NR	NA
B062G4	NR	NA
B062G7	NR	NA
B062H0	NR	NA
B062H3	NR	NA
B062H6	NR	NA
B062H9	NR	NA
B062J2	NR	NA
B062J5	NR	NA
B062J8	NR	NA
B062K1	NR	NA
B062K7	NR	NA
B062L3	NR	NA
B062L6	NR	NA
B062L9	NR	NA
B062N1	NR	NA
B062N4	NR	NA
B06200	NR	NA
B062T5	NR	NA
B062M5	NR	NA
B062M8	NR	NA
B062S9	NR	NA
Weston 9204L071		
* B062Z9	<200	U
* B062Z6	<200	U

* - Fully validated sample

NA - Not applicable

NR - Not requested

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Table 12-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Tritium Determination
Data Package Completeness Verification Results

Data Package Item	Case Number 9204L071
Case Narrative	Yes
Data Summary	Yes
Chain-of-Custody	Yes
Analysis Results	
Results Report for Sample Analyses and Reanalysis	Yes
Raw Data (Gross Counts, Count Duration, Background Counts, and Background Count Duration)	Yes
Calculation Sheets	Yes
Sample Identifications	Yes
Instrument Indentification	Yes
Analysis Date and Initials of Analyst	Yes
Sample Weight	Yes
Initial and Continuing Instrument Calibration	
Instrument Indentification	Yes
Identification of Calibration and Check Standards including Radionuclide, Certification, Issue or Expiration Date and Activity	Yes
Amount of Standard Used for Calibration	Yes
Raw Data (Gross Counts, Count Duration, Background Count, and Background Count Duration)	Yes
Counting Efficiency Determination Method and Results	Yes
Quench Correction Method	Yes
Blanks	
Instrument Identification	Yes
Date of Analysis	Yes
MDA of Method	Yes
Amounts of Reagents Used in Blank	Yes
Lot Numbers of Reagents Used	No
Raw Data (Gross Counts, Count Duration, Background Count, and Background Count Duration)	Yes
Tritum Levels in Background Water	Yes
Duplicates	
Instrument Identification	Yes
Date of Analysis	Yes
Amounts of Samples	Yes
Raw Data (Gross Counts, Count Duration, Background Count, and Background Count Duration)	Yes
Radiometric Yields	
Amount of Tritum Standartd Used for Radiometic Yield Determination	Yes
Radiometric Yield Calculations and Results	Yes
Laboratry Control Samples	
Sample Identification	Yes
Instrument Identification	Yes
Date of Analysis	Yes
Calculation of Recoveries	No
Result of Analyses	Yes
Does Missing Item(s) Affect Data Quality	No

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13.0 REFERENCES

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EPA 1988a. EPA Contract Laboratory Program Statement of Work for Organics Analyses, Multi-media, Multi-concentration. U.S. Environmental Protection Agency, Washington, D.C.

EPA 1988b. Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses. U.S. Environmental Protection Agency, Washington D.C.

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APPENDIX A
FIELD PRECISION DOCUMENTATION

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Table A-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Field Duplicate Summary

Sample No.	*B062C7	*B06302	%RPD	*B062P9	*B06308	%RPD
300-FF-5 Compounds of Concern:	µg/L	µg/L		µg/L	µg/L	
Methylene Chloride	10 U	10 U	NA	12 U	10 U	NA
1,2-Dichloroethene	10 U	10 U	NA	10 U	10 U	NA
Trichloroethene	10 U	10 U	NA	10 U	10 U	NA
Tetrachloroethene	10 U	10 U	NA	10 U	10 U	NA
Additional Compounds Originally Detected in Sample:						
Acetone	NR	22	NA	NR	NR	NA
Carbon Disulfide	NR	NR	NA	NR	NR	NA
Chloroform	5 J	5 J	0	10 U	10 U	NA
1,1,1-Trichloroethane	NR	NR	NA	NR	NR	NA
4-Methyl-2-pentanone	2 J	NR	NA	NR	NR	NA
2-Hexanone	NR	NR	NA	NR	NR	NA
1,1,2,2-Tetrachloroethane	NR	NR	NA	NR	NR	NA
Toluene	NR	NR	NA	NR	NR	NA
Xylene (total)	NR	NR	NA	NR	NR	NA
Hexane (TIC)	NR	NR	NA	NR	NR	NA
Total subst. alkanes (TIC)	NR	NR	NA	12 UJN	NR	NA
Total unknown alkanes (TIC)	NR	NR	NA	NR	NR	NA
Total unknown hydrocarbons (TIC)	NR	NR	NA	NR	NR	NA

NR - not reported as detected
NA - not applicable
* - fully validated sample

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Table A-1. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Volatile Organic Compounds
Field Duplicate Summary

Sample No.	*B062T2	*B06305	%RPD	*B062X1	*B06311	%RPD
300-FF-5 Compounds of Concern:	µg/L	µg/L		µg/L	µg/L	
Methylene Chloride	15 U	10 U	NA	10 U	10 U	NA
1,2-Dichloroethene	10 U	10 U	NA	10 U	10 U	NA
Trichloroethene	10 U	10 U	NA	7 J	6 J	15.4
Tetrachloroethene	10 U	10 U	NA	10 U	10 U	NA
Additional Compounds Originally Detected in Sample:						
Acetone	NR	NR	NA	NR	NR	NA
Carbon Disulfide	NR	NR	NA	NR	NR	NA
Chloroform	4 J	NR	NA	9 J	10	10.5
1,1,1-Trichloroethane	NR	NR	NA	NR	NR	NA
4-Methyl-2-pentanone	NR	NR	NA	NR	NR	NA
2-Hexanone	NR	NR	NA	NR	NR	NA
1,1,2,2-Tetrachloroethane	NR	NR	NA	NR	NR	NA
Toluene	NR	NR	NA	NR	NR	NA
Xylene (total)	NR	NR	NA	NR	NR	NA
Hexane (TIC)	NR	NR	NA	NR	NR	NA
Total subst. alkanes (TIC)	NR	NR	NA	14 JN	NR	NA
Total unknown alkanes (TIC)	NR	NR	NA	NR	7 UJN	NA
Total unknown hydrocarbons (TIC)	NR	NR	NA	NR	NR	NA

NR - not reported as detected
NA - not applicable
* - fully validated sample

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Table A-2. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Pesticide and PCB Compounds
Field Duplicate Summary

Sample No.	*B062C7	*B06302	%RPD	*B062T2	*B06305	%RPD
300-FF-5 Compounds of Concern:	µg/L	µg/L		µg/L	µg/L	
Aroclor-1248	1 U	1 U	NA	1 U	1 U	NA

* - fully validated sample
NA - not applicable

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Table A-2. 300-FF-5 Operable Unit Remedial Investigation Groundwater Round 2 Pesticide and PCB Compounds Field Duplicate Summary

Sample No.	*B062P9	*B06308	%RPD	*B062X1RE	*B06311RE	%RPD
300-FF-5 Compounds of Concern:	µg/L	µg/L		µg/L	µg/L	
Aroclor-1248	1 U	1 U	NA	1 UJ	1 UJ	NA

* - fully validated sample
NA - not applicable

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Table A-3. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Field Duplicate Summary

Sample No.:	B06302	B062C7	%RPD	*B06303	*B062C8	%RPD	*B06308	*B062P9	%RPD
Units:	µg/L	µg/L		µg/L	µg/L		µg/L	µg/L	
300-FF-5 Metals of Concern:									
Aluminum	21 U	21 U	NA	21 U	21 U	NA	21 U	21 U	NA
Antimony	11 U	11 U	NA	11 U	11 U	NA	11 U	11 U	NA
Beryllium	1 U	1 U	NA	1 U	1 U	NA	1 U	1 U	NA
Cadmium	1 U	1 U	NA	1 U	1 U	NA	1 U	1.2 U	NA
Chromium	54.8	43.6	22.8	5 U	5 U	NA	9.4	5 U	NA
Copper	10.5 U	10.5 U	NA	9.1 U	9.1 U	NA	4 U	4 U	NA
Iron	354	287	20.9	87.3	73.6	17.0	38.8 U	38.8 U	NA
Lead	1 U	1 U	NA	1 U	1.5	NA	1 UJ	1 UJ	NA
Manganese	6.8 U	6.1 U	NA	3.8 U	4 U	NA	1 U	5 U	NA
Mercury	0.2 U	0.2 U	NA	0.2 U	0.2 U	NA	0.2 U	0.2 U	NA
Nickel	29.3	26.7	9.3	6.8	5 U	NA	9.5	8.8	7.7
Silver	3 U	3 U	NA	3 U	3 U	NA	3 U	3 U	NA
Zinc	8 U	8 U	NA	8 U	8 U	NA	8 U	8 U	NA
Additional Metals Reported:									
Arsenic	2.4	3.3 J	31.6	2.30 J	3 J	25.6	5.2 UJ	6.8 U	NA
Barium	40.6	38.2	6.1	38.2	38.2	0.0	44.1	41.8	5.4
Calcium	30300	27700	9.0	28800	29000	0.7	45900	47100	2.6
Cobalt	2 U	2 U	NA	2 U	2 U	NA	2 U	2 U	NA
Magnesium	6340	5790	9.1	6000	6040	0.7	9540	9790	2.6
Potassium	3480	3210	8.1	3160	3370	6.4	4400	4530	2.9
Selenium	4 UJ	4 UJ	NA	4 UJ	6.9 J	NA	4 UJ	4 UJ	NA
Sodium	14000	12700	9.7	13200	13400	1.5	22000	22600	2.7
Thallium	2 UJ	2 UJ	NA	2 UJ	2 UJ	NA	2 UJ	2 UJ	NA
Vanadium	3.4 U	2 U	NA	2 U	4.7 U	NA	11.1 U	10.6 U	NA

NA - not analyzed for
* - fully validated sample

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Table A-3. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Field Duplicate Summary

Sample No.:	♦B06309	♦B062Q0	%RPD	♦B06305	♦B062T2	%RPD	♦B06306	♦B062T3	%RPD
Units:	µg/L	µg/L		µg/L	µg/L		µg/L	µg/L	
300-FF-5 Metals of Concern:									
Aluminum	21 U	21 U	NA	25.4 U	26.5 U	NA	22 U	30.7 U	NA
Antimony	11 U	11 U	NA	16 U	16 U	NA	16 U	16 U	NA
Beryllium	1 U	1 U	NA	1 U	1 U	NA	1 U	1 U	NA
Cadmium	1.2 U	1 U	NA	2 U	2 U	NA	2 U	2 U	NA
Chromium	5 U	5.3	NA	43.4	20	73.8	3 U	3 U	NA
Copper	4 U	4 U	NA	2 U	2 U	NA	2 U	2 U	NA
Iron	29.1 U	25 U	NA	420	314	28.9	185	180	2.7
Lead	1.2 U	3 U	NA	2 U	2 U	NA	2 U	2 U	NA
Manganese	5.2 U	4.1 U	NA	44.4	40.1	10.2	40.5	40.3	0.5
Mercury	0.2 U	0.2 U	NA	0.2 U	0.2 U	NA	0.2 U	0.2 U	NA
Nickel	5 U	5 U	NA	23.4	11.7 U	NA	3.5 U	3 U	NA
Silver	3 U	3 U	NA	2 U	2 U	NA	2 U	2 U	NA
Zinc	12.7	8 U	NA	11 U	11 U	NA	11 U	11 U	NA
Additional Metals Reported:									
Arsenic	9.6 UJ	6 UJ	NA	2 U	2 U	NA	2 U	2 U	NA
Barium	44.1	43	2.5	40.8	38.4	6.1	40.1	39.2	2.3
Calcium	47300	47800	1.1	12700	12300	3.2	12700	12600	0.8
Cobalt	2 U	2 U	NA	3 U	3 U	NA	3 U	3 U	NA
Magnesium	9840	9920	0.8	5230	5050	3.5	5280	5150	2.5
Potassium	4520	4580	1.3	6390	6160	3.7	6420	6300	1.9
Selenium	20 UJ	4 UJ	NA	20 UJ	20 UJ	NA	20 UJ	20 UJ	NA
Sodium	22600	23100	2.2	64000	61500	4.0	64600	62900	2.7
Thallium	2 UJ	2 UJ	NA	4 UJ	4 UJ	NA	4 UJ	4 UJ	NA
Vanadium	10 U	9.5 U	NA	2	2	NA	2	2	NA

NA - not analyzed for
♦ - fully validated sample

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Table A-3. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 Metals
Field Duplicate Summary

Sample No.:	♦B06311	♦B062X1	%RPD	♦B06312	♦B062X2	%RPD
Units:	µg/L	µg/L		µg/L	µg/L	
300-FF-5 Metals of Concern:						
Aluminum	22 U	22 U	NA	22 U	22 U	NA
Antimony	16 U	16 U	NA	16 U	16 U	NA
Beryllium	1 U	1 U	NA	1 U	1 U	NA
Cadmium	2 U	2 U	NA	2 U	2 U	NA
Chromium	3 U	3 U	NA	3.4	3 U	NA
Copper	2.4 U	2 U	NA	2 U	2 U	NA
Iron	127	55.2	78.8	85.1	52.4	47.6
Lead	1.4	2.5	56.4	4.1	2 U	NA
Manganese	1.5	1 U	NA	2.9	2.1	32.0
Mercury	0.2 U	0.2 U	NA	0.2 U	0.2 U	NA
Nickel	3 U	3 U	NA	3 U	3 U	NA
Silver	2 U	2.3	NA	2 U	2 U	NA
Zinc	62.4	47.9	26.3	11 U	11 U	NA
Additional Metals Reported:						
Arsenic	6.9	4.2 J	48.6	5.5 J	4.9 J	11.5
Barium	34.9	34.2	2.0	33.2	32.7	1.5
Calcium	38000	37600	1.1	38000	37200	2.1
Cobalt	3 U	3 U	NA	3 U	3 U	NA
Magnesium	7500	7400	1.3	7500	7340	2.2
Potassium	4610	4510	2.2	4680	4580	2.2
Selenium	4 UJ	4 UJ	NA	20 UJ	20 UJ	NA
Sodium	16800	16400	2.4	17400	17100	1.7
Thallium	5 R	1 R	NA	4 UJ	4 UJ	NA
Vanadium	8.6	7.5	NA	7.5	6.4	NA

NA - not analyzed for
♦ - fully validated sample

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Table A-4. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Field Duplicate Summary

Sample No.:	♦B062C7	B06302	%RPD	♦B06308	÷B062P9	%RPD
Analytes of Concern:						
Ammonia in mg/L	0.05 UJ	0.09 J	NA	0.06 J	0.07 J	15.4
Fluoride in mg/L	0.3 J	0.5 J	50.0	0.4 J	0.4 J	0.0
Nitrate in mg/L	4.1 J	4.2 J	2.4	4.3 J	4.3 J	0.0
Nitrite (as NO3-) in mg/L	NR	NR	NA	0.1 UJ	0.1 UJ	NA
pH	6.8 J	7.1 J	4.3	7.8	8.2	5.0
Additional Analytes:						
COD in mg/L	30 UJ	30 UJ	NA	NR	NR	NA
TDS in mg/L	158 J	161 J	1.9	NR	NR	NA
TSS in mg/L	8 J	5 UJ	NA	NR	NR	NA
Alkalinity in mg/L	73	74	1.4	NR	NR	NA
Hardness in mg/L	95	97	2.1	NR	NR	NA
Chloride in mg/L	20.9 J	19.4 J	7.4	NR	NR	NA
Sulfate in mg/L	20 J	21 J	4.9	NR	NR	NA
Phosphate in mg/L	0.4 UJ	0.4 UJ	NA	NR	NR	NA

NR - not reported
NA - not applicable
♦ - fully validated sample

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Table A-4. 300-FF-5 Operable Unit Remedial Investigation
Groundwater Round 2 General Chemistry
Field Duplicate Summary

Sample No.:	B06305	B062T2	%RPD	♦B06311	♦B062X1	%RPD
Analytes of Concern:						
Ammonia in mg/L	0.08 J	0.08 J	0.0	0.11 J	0.13 J	16.7
Fluoride in mg/L	1.3 J	1.3 J	0.0	0.4 J	0.4 J	0
Nitrate in mg/L	0.2 UJ	0.2 UJ	NA	3.1 J	3.1 J	0
Nitrite (as NO3-) in mg/L	0.1 UJ	0.1 UJ	NA	0.1 UJ	0.1 UJ	NA
pH	8.1 J	8.2 J	1.2	7.6 J	7.9 J	3.9
Additional Analytes:						
COD in mg/L	NR	NR	NA	NR	NR	NA
TDS in mg/L	NR	NR	NA	NR	NR	NA
TSS in mg/L	NR	NR	NA	NR	NR	NA
Alkalinity in mg/L	NR	NR	NA	NR	NR	NA
Hardness in mg/L	NR	NR	NA	NR	NR	NA
Chloride in mg/L	NR	NR	NA	NR	NR	NA
Sulfate in mg/L	NR	NR	NA	NR	NR	NA
Phosphate in mg/L	NR	NR	NA	NR	NR	NA

NR - not reported
NA - not applicable
♦ - fully validated sample

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